VOL. 79 No. 2010
18 JANUARY 1958

Telephone: FLEet Street 3212 (26 Lines)
Telegrams: Allangas - Fleet - London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midlands Office
Daimler House, Paradise Street, Birmingham. [Midland 0784-5]

Leeds Office
Martins Bank Chambers, Park Row, Leeds 1. [Leeds 22601]

Scottish Office
116 Hope Street, Glasgow, C2 [Central 3954-5]

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Annual subscription is: home, 52s 6d, overseas, 60s, single copies 1s 6d (by post 1s 9d)

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

OEEC REPORT

INFORMATION on Europe's chemical industry during the calendar year 1956 and the first six months of 1957 is given in the fourth report prepared by the chemical products committee of the Organisation for European Economic Co-operation (OEEC). The plan of the report is the same as that adopted in the last report which covered the year 1955 and the first half of 1956. A general survey of trends in the chemical industry in 1956 and the first six months of 1957 for OEEC countries as a whole is given, as also the trend in individual member countries and studies on various sections of the industry and on sulphurous materials. The main points indicated in the various parts of the report are published on page 159.

To avoid repetition of the last report, when certain aspects of the structure of Europe's chemical industry and its inter-relationship with other industries were stressed, this latest report has concentrated on development of the industry as a whole and of its different sectors. In particular, because of the possibilities of the establishment of a European Economic Community and negotiations for a free trade area in Europe, certain aspects of foreign trade are examined. This information should prove an invaluable background to any discussion by chemical industry leaders on free trade.

The report shows that in the year 1956 there was a noticeable continuation of the upward trend in OEEC and associate countries, i.e., the US and Canada. But by comparison with preceding years, rate of increase of the national product (less than four per cent) and of industrial production (four per cent) diminished. Reasons advanced for this are exhaustion of manpower reserves and production capacity, economic policies adopted by certain OEEC countries against inflation, and the severe winter of 1956. Events in the Middle East during the last half of 1956, however, were not found to have influenced the overall economy of OEEC countries.

Once again, the difficulties associated with the recruitment of qualified workers and highly trained staff are emphasised. An OEEC working party has been set up to study the problems arising in this field and to draw up a programme of action to help OEEC and associated countries to solve them.

The trend of total demand for chemical products for OEEC countries in 1956 is estimated to have increased by the same percentage as estimated consumption. That is, nine per cent. Demand for European chemical products on world markets, as denoted by OEEC countries' exports of chemical products, increased by seven per cent. Particularly noticeable is the trend of demand for certain groups of chemical products. A more than average increase in demand occurred in production of petrochemicals (a 19 per cent increase), in synthetic detergents (+13 per cent) and plastics materials (+21 per cent). There is reason to believe that demand for inorganic chemicals, although this cannot be evaluated in figures, has increased by less than the average of 9 per cent.

Dyestuffs demand as indicated by tonnage improved in 1956, but values were down because of lower prices. Demand in paints and varnishes (as estimated consumption) is shown to have increased by seven per cent and in soap products (excluding synthetic detergents) by at least 6 per cent.

Fertilisers were in demand. Consumption of nitrogenous fertilisers is shown to have risen by seven per cent (five per cent in 1955-56) and that of

phosphate fertilisers by six per cent compared with three per cent. Only potash fertilisers showed a lower increase, four per cent as against six per cent in 1955-56.

It is interesting to note that wholesale prices of chemical products were higher on the average in 1956 than in 1955. For OEEC countries this is estimated at one to two per cent. (Wholesale prices as a whole increased by three to four per cent in most of the OEEC countries.) Comparison with the US shows that the US price index rose on chemical and allied products by 2.3 per cent (4.5 per cent for all products). Reasons for the greater costs are the increase in average hourly wages or earnings in 1956 as compared with 1955. Increased energy costs were also a factor, as also transport in general and maritime freight in particular, which affected raw material costs.

Having regard to free trade proposals, the increased trade between OEEC countries is of interest. Compared with 1955, the chemicals trade expanded by 12 per cent. Exports to 'other countries' were also higher than ever before, and there has been a considerable expansion in trade with non-member countries during the period under review.

This increase in foreign trade in 1956 appears to be due to the greatly increased demand for chemicals. Also, liberalisation of inter-European trade has contributed to development of the chemical industry. The OEEC considers, however, the main factor in 1956 was that Europe's chemical industry was able to satisfy the needs of member countries. This is certainly indicated in the import statistics of the OEEC countries, particularly those for basic chemicals.

A slower rate of increase in foreign trade in chemicals in the first half of 1957 is noted. The suggestion offered regarding this is that trade between OEEC countries was marking time.

Of some significance is that the increase in inter-European trade was only 'very slight' in the first months of 1957 compared with the first half of 1956 and even showed a decline compared with the second half of 1956. The OEEC report cannot account for this finding.

Rate of expansion of trade with non-member countries and overseas territories also slowed down in 1956 (from 14 per cent in 1955 to seven per cent in 1956). But early in 1957 trade increased noticeably in both directions. The explanation here is that exports to these areas have to contend with protectionist or restrictive policies due to development of countries' own industries or shortage of foreign currency.

Also of value is the indication of trade with the dollar area (the US and Canada). Generally, trade with this area appears to have developed satisfactorily.

Summing up the findings of the OEEC chemical products committee it is seen that in general, the increase in world demand for chemicals and the introduction of new products each year ensure 'a relatively high rate of expansion for the chemical industry provided that there is no fundamental change in economic and political conditions.'

Considerable investment in the chemical industry is noted for 1956, and undoubtedly was continued in 1957. This should enable Europe's chemical industry to forge ahead and be favourably placed to meet demand and competition. The danger, we feel, lies in overcapacity, such as is now beginning to be noted in the US.

DECLASSIFICATION DILEMMA

REPORTS in the past week both in the sober and the more sensational sections of the press accuse the US for reasons of political expediency of delaying publication of the successful work in the field of controlled fusion reaction of Harwell atomicists. If these allegations are true—and it must be assumed that there is some truth in them—then it is a matter for regret that such tactics should mar what in the scientific field has been a record of co-operation and mutual respect over a long period. Also, if that were the case, the UK Government must be blamed for acceding to pressure through the joint declassification committee.

In fact, first news of the successful operation of the torus Zeta was given by Sir John Cockcroft when he spoke at the UNESCO conference in Paris last September (see CHEMICAL AGE, 21 September, p. 443). Sir John then said that Zeta had recently been put into operation with the objective of reaching temperatures of several million degrees. 'Promising results have already been obtained, but we require time for their interpretation.'

First news of a controlled thermonuclear reaction came from Mr. Reginald Maudling in the House of Commons on 11 November (see CHEMICAL AGE, 16 November, p. 802). A few weeks later, Mr. Harold Macmillan was asked to what extent the Harwell successes in taming the hydrogen bomb for peaceful purposes had been denied publicity by the joint declassification committee. The Prime Minister said there had been full collaboration between the UK and the US on all research work in this field. The proposals of the joint declassification committee were then being considered; if they were accepted, it would be possible to publicise more details about the work in both countries.

It is now believed that at Harwell reactions have been sustained for very brief periods at about 5,000,000°C. Very little has been said in the States about progress there, although last week Admiral Lewis L. Strauss of the AEC declared that plasmas had been contained in reaction zones for considerable periods; reaction temperatures of considerable magnitude had been reached. As for recent Russian claims of reaching temperatures of 1,000,000°C, Strauss said the US had long since passed that point.

There can be no doubt that the UK workers have, even with their limited expenditure, reached their first goal ahead of their US counterparts. But as Sir John Cockcroft stated in Paris, temperatures of about 50 million degrees were needed if energy output was to exceed input. That was, he added, likely to take much longer. The application of laboratory scale reactions to actual practice may well take anything between 10 and 20 years. However, that does not detract from the very real achievements of the Harwell team.

The suggestion that UK scientists have made big strides in their efforts to control fusion reactions, but that in terms of dollar expenditures the Zeta programme paled in comparison with the US project Sherwood was made in *Chemical Week*, 28 December, p. 65. It was estimated that Britain had spent no more than $500,000 so far, while US expenditure on Sherwood was given as over $23 million. The estimated UK cost must be considered low; the Zeta apparatus has been said to have cost upwards of £250,000.

This 'dog in the manger' attitude is not worthy of the great work now being undertaken in both countries; a great many discoveries of vital scientific importance have been made at very little cost.

The combination of British know-how and experience with American dollars will undoubtedly bring the day nearer when the glittering prospects of releasing energy from fusion reactors can become fact.

In the meantime it is vital that the achievements of British—and US—science should be made known to the world. On 24 January, the UK AEA will announce all but 'certain areas of advanced work'. A press conference will be held at Harwell on the previous day. Information on US progress will be announced at the same time.

EUROPE'S CHEMICAL EXPANSION

Output in OEEC Countries Rose 13% in First Half 1957

IN the European chemical industry in 1956, the upward trend continued, the slowing down in the rate of increase in production being less marked than for industry as a whole. The rate of chemical production increase is estimated at 8 per cent as against 11.5 per cent in 1955. The tendency was therefore for chemical production to increase more rapidly than industrial production as a whole in 1956 (8 per cent as against 4 per cent). The value added in OEEC member countries in 1956 is estimated at about $5,800 million compared with $5,300 million in 1955.

With regard to chemical production at the beginning of 1957, this is stated to have expanded at a considerably higher rate, the increase in output in the first six months of this year being estimated at about 13 per cent over the first half of 1956, compared with 5 to 6 per cent for total industrial production. In fact, the rate of chemical production increase from January to June 1957 is double that of the same period in 1956 (6 per cent). However, in several countries the index of chemical production levelled off slightly about the middle of the year.

General Analysis

These are some of the conclusions reached in the Organisation for European Economic Co-operation (OEEC) fourth year study of 'The chemical industry in Europe'.* This latest report gives a general analysis of the situation in the chemical industry in Europe and the US in 1956 and the first half of 1957.

The OEEC study indicates that in the US the index of chemical production was higher than those of other durable goods (177 in 1956 against 166 in 1955—1947–49 = 100). This index includes, however, animal and vegetable oils industry. Estimation of the rate of expansion of the US chemical industry is about 6 per cent against 13 per cent in 1955. The increase in chemical production against total US industrial production is 3 per cent. In the first half of 1947 chemical production is reported as 4 to 5 per cent higher than in the comparable period in 1956. Total US industrial production in the first half of 1957 increased by 2 per cent.

Productive capacity in Europe is stated to have been generally satisfactory in 1956. Differences in the use made of production capacity were associated with the severe winter of 1956, causing repercussions on agricultural demands, and the Middle East events which affected the soap industry.

The OEEC report notes that there was recourse to sources of coal and oil and that the petroleum chemicals industry had difficulties over obtaining necessary materials owing to the Suez situation. No other difficulties in the supply of other raw materials were reported, even the supply of titanium dioxide being easier due to increased production in Europe and the US.

The labour force in the chemical industry in 1956 totalled about 1.4 million persons (1.35 million in 1955), an increase of about 4 per cent. In the US the figure was 834,500 persons at 1 January 1957 (821,600 at 1 January 1956) an increase of 1.5 per cent. Shortage of qualified personnel is again noted.

*Available from H.M. Stationery Office, P.O. Box 569, London, S.E.1.

Boom Year?

Europe's production of chemicals in the first half of 1957 was 13 per cent up on the same period of 1956, double the 1956 rate of increase. Chemical trade between OEEC countries in 1956 expanded 12 per cent; trade with non-OEEC countries also expanded. Investment in the seven largest producing nations was up $60 million over 1955

International Trade in Chemical Products: Trade in chemicals is expanding, the OEEC survey notes. The balance of trade in chemical products with non-member countries developed favourably, the excess of exports having increased by 4 per cent in 1956 over 1955 ($1,020 million against $980 million).

Chemical trade between member countries expanded 12 per cent on the 1955 trade. Imports from the dollar area increased at a slower rate, but exports to this area increased (+ 8 per cent in 1955). Exports to other countries exceeded $1,000 million. Foreign trade in the first half of 1957 continued to increase, though at a slightly lower rate. Increase in intra-European trade has been slight compared with the same period in 1956 and even a decline when compared with the second half-year in 1956 is noted.

Trade with non-OEEC countries has expanded. Imports of chemicals from these countries were 20 per cent higher than imports in the first half of 1956 and 27 per cent higher than imports in the second half. Exports to these countries have been increasing, being 19 per cent higher in the first half of 1957 than in the same period in 1956 and 12 per cent higher than in the second half.

In comparison US chemical exports increased by 13.5 per cent in 1956, but imports by only 8 per cent. The value of US exports, at $1,273 million, was lower than those of OEEC countries to non-member countries (£1,637 million). In the first quarter of 1957, US chemical imports were 10 per cent lower than in the first quarter of 1956, but exports increased by 13 per cent. Total US exports to OEEC countries increased by 11 per cent. While the important antibiotic exports have diminished' considerable increases are noted in the import of synthetic resins ($31.5 million in 1956 against $15.6 million in 1955) and additives for lubricating oils ($17.3 million compared with $12.8 million).

Production Capacity and Productivity: Investment in the chemical industry by BLEU, France, Germany, Italy, Norway, Sweden and the UK, which account for 90 per cent of the industry's value added for OEEC countries as a whole, amounted to $900 million in 1956 compared with $840 million in 1955. The highest proportion went to organic chemicals, especially petroleum chemicals, to plastics materials, to inorganic chemicals, and to nitrogenous and complex fertilisers.

It is expected that the rate of investment will remain high in the near future. Estimates for investments in petrochemicals between January 1957 and the end of 1959 are given as $660 million. In 1956, investment in this industry amounted to $100 million. In the nitrogenous fertiliser industry an expansion of about 15 per cent in production capacity between 1957 and 1959 is forecast. Investment figures for other sectors are not known.

In the US investment in plant put into operation during 1956 amounted to $1,160 million. Plant representing investment of $1,780 million was under construction and plant in the project stage accounted for $718 million. The survey indicated that a further $1,300 million was expected to be spent in the first six months of 1957 and for the whole year, sums invested might amount to $1,800 million.

Productivity Up

That productivity increased further and substantially is indicated by the 4 per cent increase in persons employed in the industry in 1956 and the 8 per cent increase in production.

Details of turnover, added value, labour force employed, production, stability of prices, investment, etc., will be found in the table (p.160) for the UK, Germany, France, Italy, the Netherlands and Belgo-Luxembourg Economic Union.

United Kingdom: In the first half of 1957, the UK chemical industry increased its output (by 9 per cent over the first half of 1956) and the index of chemical production reached 133 for the period January to June 1957 (1953 = 100) compared with 122 in 1956. Wholesale prices for chemical products generally, however, have shown a rise of nearly 5 per cent between December 1955 and June 1957. Price reductions are noted for drugs and pharmaceuticals and in the synthetic resins and plastics materials group.

External chemical trade in 1956 showed a decrease (— 5 per cent) in imports which amounted to $308 million and an increase (+ 5 per cent) in exports, which reached $712 million. Imports from OEEC countries rose by 5 per cent, representing more than half of total chemical imports. Exports to OEEC countries (+ 14 per cent) representing 27 per cent of total exports and exports to the dollar area (+ 8 per cent), representing 9 per cent of the total, recorded the

TABLE COMPILED BY CHEMICAL AGE BASED ON OEEC REPORT

		UK	GERMANY	FRANCE	ITALY	NETHERLANDS	BLEU
Turnover	1956	£1,200 m.	DM.14,800 m.	Frs.956,000 m. (+8.6%)	Lire 1,120,000 m.	Fls.1,860 m.	B.Frs.25,250 m.
	1955	£1,110 m.		Frs.880,000 m.			
Value added ...	1956	£500 m. ($1,400 m.)	DM.7,000 m. ($1,667 m.)	Frs.375,000 m. ($1,071 m.)	Lire 477,000 m. ($757 m.)	Fls.660 m. ($174 m.)	B.Frs.10,000 m. ($200 m.)
	1955	£455 m.		Frs.345,000 m. ($986 m.)			
Labour force		355,000 (little change)	17,000 (+4%)	227,000 (little change)	195,000 (+2.5%)	53,343 (+2.6%)	48,000 (+3%)
Investment ...	1956	£118 m. ($330 m.) (+30%)	DM.1,100–1,300 m.	Frs.506,000 m. ($144.6 m.)	Lire 90,000 m.		B.Frs.1,900 m. ($38 m.)
	1955	£91 m. ($255 m.)	DM.1,140 m. ($271 m.)	Frs.423,000 m. ($120.8 m.)		$57 m.*	
Chemical Production	1956	+3%	+ 9.5%	+10.1%	+9%	+5%	+10%
	1955	+7%	+11%	+15.6%		+6%	+ 8%
Prices		+5%	+ 1%	stable	fairly stable	stable	fairly stable
Foreign Trade 1956							
Imports		$308 m. (— 5%)	$194 m. (+ 6%)	$235 m. (+25%)	$179 m. (+24%)	$179 m. (+12%)	$178 m. (+14%)
Exports		$712 m. (+ 5%)	$797 m. (+14%)	$376 m. (+ 2%)	$155 m. (+18%)	$217 m. (+12%)	$241 m. (+11%)
Imports from OEEC countries		(+ 5%)	(+ 4%)	(+25%)	$126 m. (+25%)	$139 m. (+12%)	$140 m. (+16%)
Imports from $ area			(+ 9%)	$55 m. (+40%)	$42 m. (+16%)	$29 m. (+15%)	$29 m. (+ 6%)
Imports from 'other countries'		(—12%)	(+ 7%)	(+24%)†	(+45%)		(+17%)
Exports to OEEC countries		(+14%)	(+17%)	$139 m. (+ 5%)	$62 m. (+15%)	$112 m. (+16%)	(+ 5%)
Exports to $ area		(+ 8%)	$94 m. (+24%)	$30 m. (+14%)	$24 m. (+15%)	$25 m. (+30%)	$25 m. (+16%)
Exports to 'other countries'		stable	(+ 8%)	(— 5%)	$64 m. (+18%)	$68 m. (+ 9%)	$74 m. (+26%)
Exports to overseas territories		(—12%)		$118 m. (no change)			(— 5%)
1957							
Imports		(— 2%)	(+19%)	(+20%)		$110 m. (+21%)	
Exports		(+14%)	(+20%)	(+20%)	rose more than imports	$133 m. (+21%)	

*Imports from overseas territories. †Includes high investment in petrochemicals.

highest increases while exports to other countries (more than 40 per cent of total exports) remained stable. Chemical exports continued to increase in the first half of 1957 and were 14 per cent higher than those in the same period of 1956. Imports fell, however (— 2 per cent).

Germany: There was considerable expansion of foreign trade in 1956, an increase of 14 per cent occurring in exports, valued at $797 million. Imports amounted to $194 million—a rise of 6 per cent. The rate of increase for exports was much lower compared with the 22 per cent in the previous year. Imports from OEEC countries rose by 4 per cent and imports from the dollar area and other countries by 9 per cent and 7 per cent respectively. Striking increases were shown in organic and plastics materials.

Exports rose at a similar rate to the previous year (14 per cent against 12 per cent in 1955). Exports to OEEC countries, representing just over 50 per cent of total exports, rose by 17 per cent; exports to the dollar area rose by 24 per cent ($94 million) and exports to other countries by 8 per cent. Substantial rises are noted in exports of pharmaceuticals (27 per cent) and plastics materials (22 per cent), but exports of dyes and dyestuffs declined slightly (— 2 per cent).

An increase occurred in Germany's foreign trade in chemicals in the first half of 1957. Exports were 20 per cent and imports 19 per cent higher than in the same six months of 1956. There was a noticeable rise in pharmaceuticals and also in dyestuffs.

France: Total investment in French chemical industry in 1956 is put at Frs.50,600 million ($144.6 million) compared with Frs.48,000 million ($137.1 million) in 1955.

In 1956 French chemical production rose by 10.1 per cent on 1955, the corresponding increase for 1955 on 1954 being 15.6 per cent. The production figure for industry as a whole was 8.3 per cent and 11 per cent. The index of chemical production for the first half of 1957 was 172 (1952 = 100) as against 139 in the same period of 1956 (an increase of 24 per cent) and 163 for the whole year.

Chemical imports rose substantially in 1956 reaching $235 million, 25 per cent higher than in 1955.

Exports ($376 million) rose by only 2 per cent on 1955 compared with the 8 per cent in 1955 on 1954, indicating the demand for chemical products on the French market. Imports increased from all areas. Those from OEEC countries, representing 58 per cent of the total, rose by 25 per cent. Imports from the US rose by 40 per cent reaching $55 million and imports from overseas territories also increased by 24 per cent. Organic chemicals and plastics materials were the main imports. Exports to OEEC countries ($139 million) rose by 5 per cent, and exports to the dollar area ($30 million) by 14 per cent with exports to overseas areas remaining stable. Exports to 'other countries' declined slightly (— 5 per cent). An increase in pharmaceutical exports occurred particularly in OEEC countries (+ 22 per cent) and the dollar area (+ 25 per cent). For the first half of 1957 imports and exports of chemicals both increased by about 20 per cent compared with the same period in 1956.

Output in 1957

Production of soap in Europe will be down in 1957, with a slow increase in detergents. Output of nitrogen, up 10 per cent in 1956-57, is expected to increase by 12 per cent in 1957-58. Potash fertilisers should rise 4 per cent, with phosphate fertilisers remaining stable

Italy: The survey shows that investment of Lire 90,000 million in 1956 was mainly in the petrochemicals industry, the new potash industry, plastics materials and synthetic detergents.

Chemical production in 1956 rose by 9 per cent on 1955 and also rose by 9 per cent in the first six months of 1957, compared with the same six months in 1956.

Chemical product prices remained more or less stable, the OEEC survey indicates. A slight rise in price was shown by copper sulphate and tartaric acid, but a fall in price occurred in nitrogenous fertilisers, some organic chemicals, polyvinyl chloride and polystyrene.

The table below shows that expansion in foreign trade in chemicals occurred. The corresponding figures for 1955 were 18 per cent and 15 per cent. Imports of chemical products in fact represented 6 per cent of total Italian imports in 1956 (5 per cent in 1955).

Principally, imports increased from OEEC countries (+ 25 per cent) valued at $126 million and represent more than two-thirds of total chemical product imports. Dollar area imports ($42 million) rose by 16 per cent and imports from other areas, although low, increased by 45 per cent. The largest increase was in basic chemicals, plastics materials, perfumery, cosmetics and soaps.

Italian exports ($62 million) to OEEC countries rose by 18 per cent, representing 39 per cent of the country's total chemical exports and 50 per cent of the value of OEEC imports. Exports to the dollar area ($24 million) rose by 18 per cent and exports to other countries ($64 million) also by 18 per cent. Exports of inorganic chemicals rose by 55 per cent.

In the first half of 1957 there was a further increase in foreign trade in chemicals and exports rose more than imports compared with the first half of 1956.

Netherlands: Information on turnover, labour, production, etc., is summarised in the table above. A higher rate of activity in the Netherlands chemical industry is noted during the first months of 1957, the index of production being 135 (1953 = 100) compared with 123 for the year 1956. Also, chemical production from January to June 1957 was 11 per cent higher than the corresponding period in 1956. This higher rate of activity is stated to be due in part to the repercussion on demand of the political situation at the end of 1956. It is expected, however, that chemical production for the whole of 1957 will be about 7 per cent higher than in 1956.

Exports of chemical products accounted for 8 per cent of total exports as against 7 per cent in 1955. In the main, sharp increase was recorded in exports of organic chemicals and pharmaceuticals both for 1956 and the first half of 1957. Imports of basic chemicals and pharmaceuticals also increased.

Belgo-Luxembourg Economic Union: The Belgian chemical industry recorded sales 20 per cent higher than in 1955. Imports are stated to be tending to rise more rapidly than exports, although there is still a positive balance. The imports from OEEC countries accounted for over three-quarters of the country's chemical imports. The greatest import increases were in inorganic chemicals, pharmaceuticals, manufactured fertilisers and plastics materials. Exports of organic chemicals, pharmaceuticals, fertilisers and plastics also increased.

Switzerland: Although no figures on chemical production are available, production is reported to have been satisfactory. As an indication of this, the labour force employed in 1956 stood at 39,000 persons, an increase of 8 per cent over the 1955 figure (36,000). Exports of chemical products in general accounted for 80 per cent of production, an increase of 9 per cent, and were valued at over Sw.Frs.1,000 million. Half of the exports ($120 million) went to OEEC countries, 38 per cent to 'other countries' and 10 per cent to the dollar area. Imports also increased by 9 per cent, but at $112 million remained below exports. Imports from OEEC countries accounted for about 70 per cent of the total and imports from the US for about 9 per cent.

In the first half of 1957, exports expanded still further, being 16 per cent greater by value than in the same period in 1956. Particularly marked were exports of pharmaceuticals and dyestuffs.

Austria: Chemical industry turnover in 1956 is estimated at Sch.4,300 million ($165 million) as compared with 3,800 million in 1955. The labour force amounted to 28,000, an increase of 12 per cent on 1955. Chemical production increased by 13 per cent in 1956 compared with 18 per cent in 1955, and in the first half of 1957 was 6 to 7 per cent compared with the same six months in 1955. Prices remained more or less stable. Exports expanded greatly in 1956, and at $40 million showed an increase of 30 per cent on 1955. Imports, however, increased by 20 per cent and amounted to $72 million. There was a large negative balance in Austria's foreign trade in 1956. OEEC countries accounted for 89 per cent of Austria's imports of chemical products and about one-third of its exports. The highest proportion of exports went to other countries (61 per cent).

Sweden: Estimated turnover in 1956 is put at Sw.Kr.1,300 million (Sw.Kr.1,200 million in 1955). Value added is known only for 1955 and is estimated at Sw.Kr.570 million ($110 million). The number of persons employed is not known for 1956 but it is stated that the labour force has continued to increase at a slower rate than the 3 to 4 per cent increase in 1955 when the force amounted to 20,900 persons.

Swedish Investment

Investment in Swedish chemical industry was largely in the inorganic chemicals industry and fertiliser manufacture. Because of inflationary trends in Swedish economy, investment in 1957 is suggested as likely to be lower than in previous years. Chemical production is estimated to be 5 per cent higher than in 1955. The index of wholesale prices shows a 3 per cent increase. Organic chemical prices have shown a fall, however, owing to competition.

An upward trend in foreign trade in 1956 is noted. Imports ($146 million) increased by 14 per cent (9 per cent in 1955) and exports ($51 million) by 12 per cent (18 per cent in 1955). Member countries account for 75 per cent of imports and 70 per cent of exports.

Norway: Norwegian chemical industry turnover in 1956 amounted to N.Kr.1,030 million as against N.Kr.1,024 million in 1955. Value added is estimated at N.Kr.525–530 million ($75 million) in 1956 and N.Kr.523 million in 1955. Some 16,000 persons were employed, a slight increase only on the 1955 figure (15,461).

PRODUCTION INCREASES

European production of various chemicals in 1956 increased as follows:

- **Soda ash up by 3%**
- **Chlorine up by 6%**
- **Sulphuric acid up by 5.5%**
- **Calcium carbide up by 5%**
- **Petrochemicals (in tons of carbon content) up by 19%**
- **Paints up by 7%**
- **Detergents up by 14%**
- **Nitrogenous fertilisers up by 11%**
- **Phosphate fertilisers up 4%**
- **Potash fertilisers up by 5%**
- **Plastics up by 14%**

Investment is estimated at N.Kr.95 million ($13 million) as against N.Kr.97 million in 1955. The greatest investment was in the electro-chemical industry, with a growing interest in organic chemicals and plastics materials. Chemical production increased at about 2 per cent and prices of chemical products tended to rise towards the end of the year. Foreign trade increased in both directions. Imports in 1956 amounted to $56 million (+ 12 per cent) but exports at $61 million increased by only 6 per cent.

Trade with OEEC countries accounted for 70 per cent of imports and exports. Twenty per cent of exports went to 'other countries'. Fertilisers alone accounted for over half ($34 million) of Norway's exports of chemical products.

Denmark: Figures of turnover for 1956 are not given in the OEEC survey. Due to the severe winter and Government anti-inflationary policy, demand and hence production was at a low level. Foreign trade in chemicals expanded noticeably, imports ($105 million) increasing by 23 per cent and exports ($33 million) by 29 per cent compared with 1955.

OEEC countries provided almost 90 per cent of Denmark's imports. These same countries received 42 per cent of Denmark's exports and 'other countries' rather less than half. More than one-third of the total exports were in the pharmaceutical group.

Portugal: Few details are available on Portugal's chemical industry. Imports amounted to $36.5 million, an increase of 11 per cent on 1955. Exports in 1956 at $17 million increased by 23 per cent. OEEC countries accounted for 85 per cent of imports and 60 per cent of exports. Exports to overseas countries at $4.8 million are described as relatively important.

Inorganic Chemical Industry: Production increased at a slower rate. Soda ash increased by about 3 per cent as against 6 per cent in 1955. Chlorine production was 6 per cent greater than in 1955. The estimated increase in caustic soda is 4 per cent. Production of sulphuric acid increased by 5·5 per cent (1 per cent less than in 1955). The rate of increase of calcium carbide was higher at 5 per cent (4 per cent in 1955).

Organic Chemical Production: It is suggested that the rate of expansion slowed down in relation to 1955. In the petroleum chemicals sector, expansion continued and output increased (expressed in tons of carbon content) by 19 per cent in 1956 (30 per cent in 1955). Overall consumption of benzene, naphthalene and acetylene in Belgium, France, Italy and Sweden rose by about 15 per cent over 1955.

Dyestuffs: Production again fell by about 4 per cent in volume and 7 per cent in value. Production in 1957 is expected to be 3 per cent higher.

Paints and Varnishes: There was a 7 per cent increase in 1956.

Medicinal and Pharmaceutical Products: Comparable statistics for OEEC countries are not available but from the trend of imports and exports the rate of increase in production in this sector was greater in 1956 than chemical production in general.

Soap and Synthetic Detergents: Production in 1956 was 7 per cent greater in volume (4 per cent in soaps and 14 per cent for synthetic detergents). The increase in soap production (cf. — 1 per cent in 1955) compared with detergents (+ 21 per cent in 1955) is considered to be due to the political situation at the end of 1956. A downward trend for soap products in 1957 is therefore expected with a slow increase in detergent production.

Fertilisers: Nitrogenous fertiliser production increased considerably in 1956-57 (+ 11.5 per cent). Total nitrogen production was at a slightly lower rate (+ 10 per cent). Phosphate fertiliser production rose by 4 per cent by virtue of an increase in output of basic slag and complex fertilisers. Single superphosphates declined again. Potash fertilisers increased by 5 per cent. Nitrogen production is expected to increase by 12 per cent in 1957-58 and potash fertilisers by 4 per cent, while phosphate fertilisers will remain stable.

Plastics Materials: Producers' sales were 14 per cent higher than in 1955. Total sales in OEEC countries are stated to amount to just over 1.2 million tons (1.7 million tons in the US). Sales of thermoplastic products showed the highest increase in both Europe (+ 21 per cent) and in the US (+ 13 per cent).

Sulphurous Materials: With rising outputs in the US and Mexico and mounting tonnages of sulphur from oil and natural gas the situation remained easy. Output in OEEC countries rose by 8 per cent in 1956, and consumption by 6 per cent. The largest increases were noted in production and consumption of anhydrite which is reported to have increased by 50 per cent in the last 12 months. Imports of sulphurous materials remained stable and exports rose by 13 per cent.

★ With controlled fusion reaction in the news, I was interested to learn that the General Electric Co. of America say they have been studying the problem for more than a year.

According to the company's vice-president and director of research, five years will be needed to make a true appraisal of the process; 10 years to bring it to the point of technical feasibility and 10 more years before pilot-plant production could be begun.

It seems to me that the situation has already been appraised at Harwell and that they are likely to reach the point of technical feasibility by five years. Pilot-plant production would seem to be not more than 10 years away from now. Continued co-operation between the US and UK atomic scientists may well narrow this time.

★ Two of the chemical industry's leading globe-trotters are off again. First to leave the UK was Sir Alexander Fleck, ICI chairman, who flew from London on 10 January on a four-week visit to India, Burma, Bangkok and Malaya. He returns by air from Singapore on 6 February.

Mr. Bernard Hickson, chairman of Hickson and Welch and chairman of the Association of British Chemical Industries, left on 16 January on a two-month visit to South Africa. Mr. Hickson expects to return to the UK on 12 March.

★ Evans Medical Supplies scored a publicity success for their import of the first Salk poliomyelitis vaccine. Dr. F. S. Gorrill, deputy managing director, was interviewed on the BBC home and light programmes on the subject of the cargo that arrived at Ringway Airport, Manchester. Three days later he was interviewed at the BBC TV studio in Manchester, while the following evening the BBC showed a documentary film of the despatch of the vaccine from the company's Speke, Liverpool, headquarters.

Apart from publicity on a large scale in the national and provincial press, Evans Medical also had the benefit of an ITV news broadcast on the arrival of the vaccine at Ringway.

The company is distributing the vaccine throughout the UK on behalf of the Ministry of Health.

★ Last week a train enthusiast, this week I am reporting a visit to the National Boat Show, where as one who likes 'mucking about in boats' I was in my element. There was, however, plenty to interest the chemist at Olympia even if he cannot stand the sight of the sea.

As was to be expected there were even more examples of polyester/glass fibre craft than before. There were many exciting designs not possible to achieve with moulded traditional materials. Among the newer materials, an inflatable three-man craft made from a neoprene-proofed Terylene fabric attracted much attention. This was developed by Beaufort (Air-Sea) Equipment in co-operation with ICI fibres division. Transparent sails made from sheet Terylene were also in evidence, but it will be a long time before they catch up with the nylon sail in popularity.

Chippendale Boats showed the first boat ever constructed from a new ply permanently decay-proofed and protected against all types of teredo and limnoria. Also said to give protection against soft rots, termites and the grubs of wood-destroying insects, it is made from veneers vacuum-pressure impregnated with Tanalith C made by Hickson's Timber Impregnation Co. (GB) Ltd., of Castleford. Weatherproof Casophen resorcinol glue was used throughout.

Uses of Beetle polyester resin in boat building were demonstrated by BIP Chemicals, including self-extinguishing types, a chemical corrosion-resistant resin and a low viscosity flexible-type resin.

★ The world's first chemical-fuelled bomber is to be developed by the North American Aviation Company who have been awarded a contract for this purpose by the US Air Force. Using boron as its power, it is expected to be in the air by the early 1960's, before any atom-powered bomber can become airborne.

Lieutenant-General Irvine, deputy chief of staff and materials for the USAF, says that the chemical bomber will be truly intercontinental and able to make round-trip runs to the target without refuelling. It is planned to fly at more than 2,000 m.p.h.

Obviously an airplane of this type would not only revolutionise military strategy, it would also give commercial aircraft an almost unlimited range without much greater weight of fuel. It seems that the US Borax and Chemical Co., largely owned by British capital, will supply the requisite boron.

★ Britain's only salt mine is playing a useful part in the International Geophysical Year. The Cambridge University department of geodesy and geophysics is interested in the phenomenon of 'earth tides'. The Winsford mine of ICI salt division is being used for measuring these slight distortions.

At the bottom of the mine, 490 ft. below ground level, Cambridge scientists have installed two horizontal 'pendulums' one swinging north to south and the other east to west. The January issue of *ICI Magazine* describes these as 'miniature five-barred gates supported by thin filaments'. On each is a small mirror which reflects a trace of light on to a strip of photographic film. The film is moved steadily forward by a clock mechanism and any tilt of the earth is shown on the film.

Also measured is distortion of the earth caused by the movement of low-pressure systems in the atmosphere.

★ US research workers it seems have found an effective way of combating blackhead (infectious enterohepatitis) of turkeys, a costly scourge of the poultry industry. The disease is usually transmitted by infected faeces. An ideal medication is one that will prevent the malady and at the same time permit optimum growth and performance of birds under treatment.

According to an investigation of suppression of clinical blackhead in turkeys conducted by L. C. Costello and E. M. De Volt, department of animal pathology, livestock sanitary service laboratory, University of Maryland, furazolidone seems to be such a medication. Satisfactory results were achieved with furazolidone administered in feed in concentrations of 0.011 per cent, 0.0167 per cent and .033 per cent to 124 turkey poults for 8 to 10 weeks. Results were in general agreement with reports from use of the drug under field conditions. Whereas 31 of 122 untreated controls died, all of 125 treated with furazolidone survived.

At these high therapeutic levels, furazolidone (Neftin), one of the antimicrobial nitrofurans, did not significantly retard growth of the birds.

★ Although the outlook for business between UK chemical firms and Latin America can hardly be described as good, there are opportunities there for those companies willing to take the trouble to develop the market. This is obvious from a recent visit made by Baron Rolf Beck, chairman of the Slip group, Great St. Helens, London EC3.

Baron Beck, who visited Mexico, Guatemala, Salvador, Costa Rica, Panama, Venezuela, Curacao, Colombia, Ecuador, Peru, Chile, Argentina, Uruguay and Brazil, says that his is the largest company in Europe selling chemical additives that enable fuel oil to be burnt more completely and cleanly. He testifies to the help of British Embassies and Consulates in helping to arrange his trip. In some cases commercial officers thought the outlook was gloomy but said it would be worth while for the head of a British company to visit the territory.

A seven-week visit to the 14 countries resulted in sales worth $250,000. In addition a number of agents and distributors were appointed. In describing the development of Venezuela, Baron Beck says the word 'fabulous' would be an understatement as this hard currency market is expanding faster than the US did about 30 to 40 years ago.

Alembic

FACTORIES MUST BECOME MORE SAFETY CONSCIOUS

Chief Inspector's Annual Report

INDUSTRY must develop a higher standard of safety consciousness said Sir George Barnett, former Chief Inspector of Factories, recently. Training must be stepped up for all—foremen, chargehands, managers, etc. Sir George was introducing the 'Annual Report of the Chief Inspector of Factories for 1956'*.

Gassing accidents were slightly lower than the previous year, said Sir George. A pleasing feature was the decrease in carbon monoxide poisoning cases which were well below the 100 mark (89) with 11 fatal cases. Poisoning cases were roughly the same as 1955. There was, however, a tendency for more cases from organic chemicals, e.g. the number of cases of aniline poisoning increased from 9 to 19. Five of these were, however, in one accident.

It was not compulsory to report dermatitis cases but the indications were that the number was down.

Ionising radiations were used in 362 factories, an increase on the 1955 figures. This subject has come up for special discussion in the report. 'It has been increasingly felt that the use of radioactive materials (other than for luminising, which is the subject of existing regulations) should be brought under more detailed control.'

Expert Committee

An expert committee was formed to examine a draft code of regulations. These regulations have since been published and cover X- and gamma radiography, X-ray fluoroscopy and crystallography, radioactive static-eliminators and thickness gauges, X-ray thickness gauges, and X-ray and radioactive sources for irradiation of chemicals, foods etc.

The new Chief Inspector of Factories, Mr. T. W. McCullough, also mentioned radioactive hazards. He said that inspectors were being sent to Harwell on short training courses. They would then be in a position to inspect factories where radioactive isotopes were being used.

Some suitably qualified inspectors with the necessary technological background had also been sent on more advanced, longer courses at Harwell.

Corporate efforts were being made by some industries, said Mr. McCullough. In particular he mentioned the indiarubber industry, together with paper, linoleum iron and steel, aluminium and cement.

Notified accidents in all premises subject to the Factories Act totalled 184,098 non-fatal and 687 fatal. Under the section chemicals, etc., accidents for 1956 were: artificial manure, 290; coal tar, 1,391; other chemicals, 4,226; and paint, colours and varnish, 528. The total figure is 6,435, of which 21 were fatal and 6,414 non-fatal.

Fire risks are dealt with in the report. The use of metals which melt easily can cause a serious hazard in a fire. A case is reported in which the safety valve pipe from a distillation plant terminated near a lead pipe carrying a toxic gas. The still overheated and vapour from the safety valve ignited, causing the lead pipe to melt and allowing the toxic gas to escape. The risk to firemen dealing with the blaze was very much increased. The lead pipe has since been replaced by one of nickel.

On the subject of ventilation the report says that the standard continues to improve slowly. It was disappointing to note, however, that many buildings were still being erected without adequate provision for ventilation.

Gassing accidents totalled 236 of which 18 were fatal. These were subdivided as:

	Total	*Fatal*
Carbon monoxide	89	11
Carbon dioxide	2	—
Hydrogen sulphide	15	1
Sulphur dioxide	4	—
Chlorine	21	—
Nitrous fumes	6	1
Ammonia	12	1
Benzol	5	1
Naphtha	—	—
Petrol and benzene	3	1
Trichlorethylene	12	—
Nickel carbonyl	1	—
Phosgene	3	—
Hydrochloric acid	—	—
Hydrocyanic acid	2	1
Bitumen, creosote, tar, oil	—	—
Other	61	1

The fatal hydrogen sulphide gassing occurred at a carbon disulphide plant where an employee was rodding-out a pipe blockage. At the inquest the jury added a rider that breathing apparatus should always be worn when rodding-out is being done.

Six cases of nitrous gassing were reported, including one fatality, compared with 15 non-fatal cases in the previous year.

The fatal case was a wire cleaner in a wire mill who was pouring 80 per cent nitric acid from a carboy into a rubber bucket. The bucket split and to prevent acid running on to the floor he placed an old galvanised bucket underneath it. Dense red fumes of nitrogen peroxide were evolved to which he was exposed for about half a minute. He died 15 days later. An autopsy showed bronchiolitis with obliteration of the alveoli. There was also evidence of long standing lung disease.

Cases of lead poisoning decreased from 69 non-fatal in 1955 to 49 with one death in 1956. Among the cases reported was that of a chemical plumber who for part of his five years' employment had been exposed to fumes while lining tanks with homogeneous lead. He had been investigated as a possible lead poisoning case 12 and 9 months before finally being notified as a case. He was then admitted to hospital suffering from colic, constipation, vomiting and weakness of the extensor muscles of the wrists.

Two cases were reported from paint and colour works, both being employees working on filter presses. The one fatal case of lead poisoning was a building painter, aged 70, who died from the effects of lead poisoning diagnosed in 1944, since when he had been unable to work. There was one other case involving painting of buildings, and two cases from paint used in other industries.

Aniline poisoning cases increased from nine non-fatal in 1955 to 19 with one fatal in 1956. The fatal case was that of a pipe fitter's mate who was sprayed with the contents of an autoclave, mainly aniline with some diphenylaniline and small quantities of ammonia. He died three days later from acute ulcerative bronchitis and bronchial pneumonia. His companion was also very seriously ill as a result, but recovered.

Two further cases of aniline poisoning emphasised the fact that cyanosis may be overlooked when work is done under artificial light. The men, night-shift workers, were disposing of small quantities of chloraniline in an incinerator. They suffered from headache and dizziness but their slight cyanosis was not detected until daylight.

The further point is made that inexperienced workers always underestimate the dangers of aniline and its compounds, particularly the risk of skin absorption.

A chapter is devoted to ionising radiations. By the end of 1956, 362 factories were receiving radioisotopes from Harwell, Amersham and Risley. The most extensive use of these materials is for the gamma-radiography of castings, welds, etc., using chiefly iridium-192 and cobalt-60. Caesium-137 is reported to be gaining favour because of its long half-life of 33 years.

Second important uses are thickness gauging and static eliminators. Strontium-90 and thallium-204 are the favoured isotopes, both used in foil form. Up to the end of 1955 thallium-204 was only available in electrodeposited form which was never really satisfactory because of a tendency for the active material to flake loose from its base plate under its protective foil.

From the beginning of 1956 manufacture of this material was stopped and existing sources were called in and replaced by foil sources.

The overwhelming use of isotopes is as sealed sources, normally measurable in curies. The amount used in unsealed form is regarded as trivial and in general only measurable in millicuries.

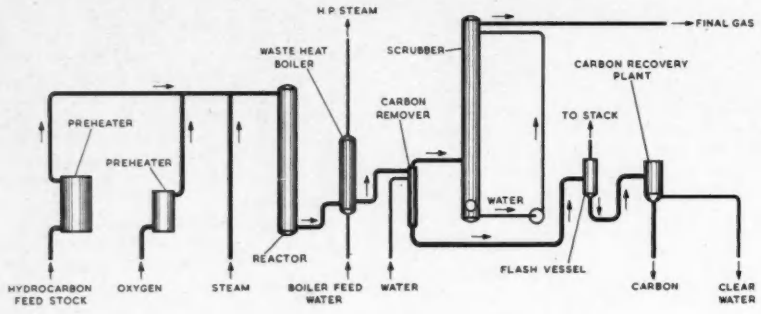
HM Stationery Office, 9s. 6d.

Petrochemicals in the Home

'THE petroleum chemist's contribution to home life' will be the subject of an open meeting of the Leeds section of the Royal Institute of Chemistry and the Society of Chemical Industry, Yorkshire section, to be held at the Queen's Hotel, Leeds, on 6 February at 7.30 p.m. The speaker will be R. C. Tarring of Shell Chemical Co. and the lecture will include demonstrations and film illustrations.

An exhibition of products based on petroleum, including man-made fibres, plastics, cosmetics, detergents, etc., will open at 6.45 p.m. Tickets, costing 6s., may be obtained from T. G. Carruthers or W. A. Wightman at the University of Leeds, Leeds 2 or through any committee member. Applications must be made before 3 February.

SHELL GASIFICATION PLANT WILL PRODUCE 200 TONS A DAY



THE SHELL GASIFICATION PROCESS

A SHELL gasification plant now being built by Woodhall-Duckham Construction Co. Ltd., 63-77 Brompton Road, London SW3, at the Shellhaven refinery, Essex, will have a throughput of 200 tons of heavy fuel oil a day. It will provide gas for the manufacture of synthetic nitrogen fertilisers.

First industrial application of the process, developed in Holland by the Royal Dutch/Shell Group, was commissioned in December 1956 at Ijmuiden. It has a daily gasification capacity of 50 tons of heavy oil and supplies gas for synthesis purposes to the Mekog Works.

The Shell gasification process is based on the continuous, non-catalytic, partial oxidation of liquid or gaseous hydrocarbons to produce a gas high in hydrogen and carbon monoxide suitable for use in synthesis and in the production of gas for town distribution. It uses oxygen or oxygen-enriched air and operates at high pressure. Conditions in the reactor can be changed as required to suit the type of hydrocarbon feedstock it is desired to gasify. The process provides for the gasification of a wide range of feedstocks.

The diagram shows that the principal parts of the plant incorporating the Shell gasification process are the reactor, the waste heat boiler, the carbon extraction and recovery equipment and gas scrubber. The waste heat boiler operates continuously in the production of steam at any desired pressure and is readily maintained in operation over long periods without recourse to cleaning. Steam produced is sufficient for use in the process and provides also a substantial quantity for other purposes.

Commercial scale operation has shown that the plant is completely reliable, highly efficient and that maintenance costs are low, the economic attraction of the process increasing with the size of plant. This, while true for most processes is said to be particularly so where oxygen plant is involved.

The advantages of the Shell gasification process include wide flexibility in the choice of feedstock; recovery as high pressure steam of substantially all the heat developed by the reaction; highly efficient means for the removal of carbon; easily controlled operation at the desired pressure; compact and simple apparatus occupying small ground space.

New Handbook Describes Isceon Range

PROPERTIES, uses and manufacturing methods for the range of chlorofluorocarbon compounds made by Imperial Smelting Corp.—the Isceon range—are described in a book entitled 'Isceon' published by the company.

To identify the various compounds a simple numbering system has been adopted. Each Isceon is given three numbers the first of which gives the number of carbon atoms, the second the number of chlorines and the third the number of fluorines. Since these compounds are all saturated aliphatic there is no need to specify the number of hydrogen atoms.

At present nine compounds, 131, 122, 113, 104, 121, 112, 103, 233 and 224 are in production or under development. A full-scale plant has been constructed at the Avonmouth works of Imperial Smelting and began production at the beginning of 1957.

Two grades of material are produced, a propellent grade and a refrigerant grade which is claimed to be of a particularly high standard of purity with a small proportion of water and other impurities. Traces of water in a refrigerant system can lead to the blockage of pipes and valves due to the formation of solid hydrates and ice.

Details of the physical properties of Isceon 122 and 131 are given in the book. They are described as typically non-polar and hence are good solvents for non-polar compounds and poor solvents for many highly polar compounds. Both 122 and 131 are said to be incapable of propagating a flame and are classed as non-combustible and non-flammable.

Toxicity is described as low, 122 falling in group six and 131 in group 5 of the US underwriters' laboratory tests.

Thermal stability is high and the stability increases as the ratio of fluorine to chlorine atoms increases. Isceon 131 begins to decompose at 400 °C but 122 is stable up to 700 °C. Resistance to hydrolysis is higher than that of the corresponding chlorohydrocarbons.

Almost all metals are claimed to be completely resistant to 122 and 131 at normal temperatures. At temperatures above 200 °C mild steel is slowly attacked. Magnesium alloys and aluminium containing more than 2 per cent magnesium are not recommended for systems where both water and Isceon may be present.

A number of nomographs for determining properties of 122/131 mixtures are included, together with tables of thermodynamic properties.

Copies of the book may be obtained free of charge by persons writing on their company's notepaper to Imperial Smelting Corp. Ltd., 37 Dover Street, London W1.

Borax Introduce Metallic Borides

SIXTEEN metal-boron compounds are being marketed by Borax Consolidated Ltd., Borax House, Carlisle Place, London SW1. Two series of borides, one of high chemical purity (not less than 99.8 per cent) and the other comprising technical grades of minimum purity of the order of 99 per cent, will be available. Several borides of the more important metals such as chromium, molybdenum and tungsten appear either in one or both of the ranges as well as the borides of some of the less common metals such as titanium, zirconium, vanadium, niobium and tantalum.

The 11 compounds in the pure series are described as dense, hard powders of average particle size of 10 to 50 microns and the 14 in the technical series are stated to be finer, averaging five to 10 microns in particle size.

Two technical data sheets—one for each series—have been published by Borax Consolidated Ltd. These list the chemical analysis, specific gravity, melting point and hardness of each compound. The electrical conductivities are also included.

International Instrument Show by London Firm

THE International Instrument Show to be held at Caxton Hall, London, during the last week of March will be almost one-third larger in floor area than the 1957 exhibition and will occupy the Great Hall and Court Room. It is expected that over sixty factories covering ten countries will be participating, and their products will include a number of the latest technical achievements in the fields of printed circuit, UV-TV microscopy, e-p-r spectroscopy and telemetry.

Normal day opening hours will be from 10.30 a.m. to 6.30 p.m., but the show will remain open until 9 p.m. on Wednesday 26 March, and also until 12 noon on the following Saturday morning.

Tickets are available on request from the sponsors, B and K Laboratories Ltd., 57 Union Street, London SE1.

THIOBENZOIC ACID AVAILABLE IN DEVELOPMENT QUANTITIES

THIOBENZOIC ACID, known since 1868, is a very reactive chemical. Now that it is available in development quantities from Robinson Brothers Ltd., West Bromwich, it is considered that it should find application in organic syntheses generally. Various salts and derivatives are used in dyestuffs manufacture, as modifiers in synthetic rubber manufacture, as lubricating oil additives, antioxidants in rubber, and as intermediates in vitamin and drug syntheses. Having the general formula C_6H_5-COSH, thiobenzoic acid is a bright yellow mobile liquid which can be distilled under reduced pressure in an atmosphere of nitrogen. At atmospheric pressure thiobenzoic acid decomposes to a mixture of sulphuretted hydrogen, sulphur and benzoic acid and tetraphenyl thiophene. Solubility in water at room temperature is approximately 0.15 per cent w/v and water is rather less than 1 per cent soluble in thiobenzoic acid at room temperature. It is miscible with almost all organic solvents, including petroleum ether.

Robinson Brothers report that thiobenzoic acid is stable for at least two months if kept in a full stoppered bottle. On exposure to air, it oxidises to dibenzoyl disulphide which can be detected by allowing a 5 per cent solution in 60/80°C petroleum ether to remain corked for one hour. If no precipitation occurs within this time, there is less than one per cent dibenzoyl disulphide present.

Other Disulphides

Three other disulphides have been formed from thiobenzoic acid. These are dibenzoyl monosulphide, dibenzoyl trisulphide and dibenzoyl tetrasulphide. The latter two decompose on standing for some days.

As thiobenzoic acid is quite a strong acid, it will decompose sodium carbonate and sodium bicarbonate. Its sodium salts are stable to acid as low as pH5. Salts which have been isolated include barium, stable on heating to 120°C; lead and silver, unstable on heating; nickel, soluble in organic solvents; insoluble in water; mercuric; ammonium, very water soluble; zinc; and cadmium.

Nickel, zinc and cadmium thiobenzoates form complexes with pyridine, of the general formula $(C_6H_5COS)_2$ X .2Py and the nickel complex is found to be so stable that it can be recrystallised from benzene. Addition salts with amines are also known as for example, diisobutylammonium thiobenzoate.

Esters of thiobenzoic acid are easily formed by heating sodium or potassium thiobenzoate with an organic halide, generally in alcoholic solution. These esters are stated to be more stable to acid than those of thioacetic acid.

The esters can hydrolyse in acid solution. Depending on the ester and on the conditions used, alkyl thiobenzoates and water form benzoic acid and alkyl mercaptans, a reversible reaction when no other chemical is present. When saponified by alkali, the reaction goes to completion, the end products being a mercaptan and benzoic acid. This reaction has been used as a method of forming mercaptans such as benzoylbenzhydrylthiol, dinitrophenylthiol, cyclohexylmercaptan and thioglycollic acid.

Thiobenzoic acid will saturate a double bond. Thus with vinyl acetate in presence of air, it forms β-thiobenzoyl ester of ethyl acetate and cyclohexyl thiobenzoate with cyclohexene. It reacts with ethylene oxide to form β-thiobenzoyl ethanol, with hydroquinone in ether solution to form 0-thiobenzoyl hydroquinol, and heated with benzaldehyde in a stream of dry HCl, benzylidene bis thiobenzoate is formed. This same compound is formed by heating thiobenzoic acid in the presence of potassium thiobenzoate, triethylamine or boron trifluoride, elemental sulphur being formed at the same time.

Primary aliphatic thiocyanates and some substituted aromatic thiocyanates such as benzyl, p-bromobenzyl, p-nitrobenzyl and m-xylyl thiocyanates react with thiobenzoic acid to produce the corresponding ester of N-benzoyl dithiocarbamic acid with little or no by-product. Other thiocyanates (i.e. phenyl) react with thiobenzoic acid to form thiocyanic acid and thiobenzoyl esters. Alkyl and aryl isothiocyanates react even more vigorously with thiobenzoic acid producing a substituted benzamide and carbon disulphide.

Several different uses have been suggested for thiobenzoic acid. Potassium thiobenzoate reacted with substituted aminoanthraquinones in amyl alcohol solution produces vat dyestuffs, such as 1.3 dibromo 2 amino-anthroquinone. N-Dodecyl thiobenzoate benzyl thiobenzoate and trichlorobenzyl thiobenzoate have been suggested as modifiers in the manufacture of styrene-butadiene copolymers. The last named has also been suggested as an extreme pressure additive in lubricating oils. Thiobenzoic acid acts as a peroxide decomposer in rubber.

Ethyl thiobenzoate, used as a precurser of ethyl mercaptan, has been shown to have high anti-tuberculosis activity in the mouse.

New UK Laboratories as Part of Pfizer's Research Expansion

MAJOR extension of the research facilities of Chas. Pfizer and Co. Inc. is reported from the US. Mr. John E. McKeen, president of Pfizer, recently announced that a new research building would be erected near the company's factory at Groton, Connecticut. It will have facilities for chemical, medical and fermentation research, as well as for mycology, bio-assay and chromatography.

Pointing out that his company had spent over £3 million this year alone on research, Mr. McKeen stated that the equivalent of over £18 million was to be spent by Pfizer on new research, production and distribution facilities, both in America and abroad.

As part of this development Pfizer Ltd. are opening new laboratories and extending existing ones at their factory at Sandwich, Kent. The company is spending a considerable sum on independent fundamental research projects, in addition to opening new development and production-control laboratories.

Among the senior research staff appointed by Pfizer are: Dr. R. J. Boscott, formerly lecturer in endocrinology at Birmingham University; Dr. H. H. R. Reinert, formerly lecturer in the Pharmacological Institute of the Free University, Berlin; Dr. P. B. Stones, for the past five years lecturer in bacteriology at Manchester University; and Dr. R. E. H. Swayne, a research chemist, who will be research liaison officer.

S. P. Chambers at BIMCAM Lunch

At the annual lunch of the British Industrial Measuring and Control Apparatus Manufacturers' Association, l. to r., L. S. Yoxall, BIMCAM president; S. P. Chambers, senior deputy chairman, ICI Ltd.: and Eric W. Wilson BIMCAM chairman. For report of lunch see CA, 11 January, p. 132

CHEMISTRY OF LINEAR ALIPHATIC POLYMERS

A. R. Munden at Cardiff Meeting

BECAUSE polymers are often important for their physical properties, their behaviour as chemicals is sometimes forgotten. This was observed by Mr. A. R. Munden, B.Sc., F.R.I.C., (British Nylon Spinners Ltd.) when he addressed the Society of Chemical Industry at Cardiff recently, on the subject of 'Preparation and reactions of nylons.'

Mr. Munden restricted himself to the simple linear aliphatic polyamides which contained a recurring group of the type CO $NH(CH_2)_x$. Even in such a restricted group of compounds as this, many aspects of their chemistry could be overlooked. For instance, in the preparation of these materials, many textbooks contented themselves with the statement that nylons were condensation polymers, formed either from diamines and dicarboxylic acids

$$NH_2\ RNH_2 + HOOC\ R'\ COOH \xrightarrow{H_2O} [NH\ RNHCO\ R'CO]$$

or from amino acids:

$$NH_2R\ COOH \xrightarrow{H_2O} [NHRCO]$$

This, however, could be misleading. First, nylons could be formed by processes other than condensation. Second of the four present commercial nylons, only one was formed directly by the process indicated.

The methods of preparation of nylons could be summarised:

Nylon	*Reactions*
6.6	Condensation of salts of diamine and dicarboxylic acid.
6.2	Condensation of diamine and dicarboxylic acid ester.
1.6	Carbonium ion reaction of dinitrile and formaldehyde.
11	Condensation of amino acid.
6	Polymerisation of lactam.
4	Base catalysed polymerisation of lactam.
3	Migrational polymerisation of acrylamide.
2	Polymerisation of anhydrocarboxy-amino acid.

In treating the reactions of these polymers, once formed, a new factor came into play, the physical structure of the polymer. There was, in fact, an interplay between the physical and chemical structures of a polymer. The importance of the physical structure of a polymer was that it largely determined mechanical properties and mechanical properties were among the main selling features of most polymers, and the physical structure of a polymer was at least in part a function of its chemistry.

It was pointed out that the chemical features involved might not be merely the main functional groups (in the case of nylons, the amine and carboxyl end groups and the amide links) but also molecular chain length and the results of side reactions in polymerisation, giving branching, cross-linking, oxidation etc. These second order effects in chemistry may produce first order effects in physical structure.

On the other hand, chemical reactions with a polymer were often carried out under heterogeneous conditions, where rates and even extents of reaction may be determined by the ability of the reactants and products to diffuse to and away from sites. So that the physical structure in time affects the chemical reactivity.

Mr. Munden then examined two aspects of physical structure, namely spherulitic crystallisation and molecular alignment.

Spherulites, he said, were ordered structures, probably partly crystalline, partly amorphous, which grew radially in nylon (and in other polymers, too), either when cast from solution or cooled from a melt under certain conditions. They were readily seen under the microscope in polarised light.

Some spherulites formed around predetermined nuclei and could be melted, to re-form again in the same position on cooling. Such nuclei could arise from impurities present or formed during polymerisation, Mr. Munden stated. Increasing molecular chain length would retard spherulite formation. So, too, would cross-linking reactions.

Molecular Alignment

Molecular alignment was readily induced in fibrous nylons by the process known as cold drawing, whereby the molecular chains were more or less aligned along the fibre axis. Here decreasing chain length and increasing cross-linking retarded alignment. Discussing the reactivity of nylon and the way in which reactivity was affected by physical structure, Mr. Munden said that first, the amine end groups were responsible for the uptake of anionic dyes. The sulphonic acid groups formed a salt type linkage with the nylon, and with certain dyestuffs and conditions there was a stoichiometric relationship between dye uptake and amine end group content.

If the amine end groups were acetylated, the uptake of anionic dyes was reduced or even completely prevented through removal of the dyeing sites. If the nylon was cold drawn, uptake of dyestuff was retarded, but in this case there was a reduction in rate only; if dyeing were continued long enough the equilibrium uptakes would be identical.

Anionic dyes would penetrate spherulitic structures so long as the normal acid conditions were used. Under neutral or alkaline conditions, however, only the non-spherulitic regions were dyed. This intriguing effect remained unexplained, probably because so little was known about the internal structure of spherulites.

Mr. Munden said that the amide links would undergo reactions through substitution of the amide H. Methylol groups might be introduced by treatment with formaldehyde and a catalyst. These methylol groups readily underwent further reaction to produce methylene cross-links.

Treatment with both formaldehyde and alcohol with an acid catalyst introduced N-alkoxymethyl groups.

The reaction could be carried out under homogeneous conditions, e.g. with the nylon dissolved in formic acid, or as a heterogeneous reaction with formaldehyde and alcohol in the vapour phase reacting with nylon impregnated with an acid catalyst.

In the latter case it was possible to convert normal nylon fibres into elastic fibres. In the heterogeneous reaction, cold drawing would reduce the rate of reaction appreciably. Reference was made by Mr. Munden to a comprehensive study of the nitrosation of substituted amides, published by E. H. White in 1955, who demonstrated the efficiency of such nitrosating reagents as N_2O_3 and N_2O_4 and showed that the nitrosated amides were decomposed by heat. The nitrosation reaction did not take place so readily as the corresponding reaction with secondary amines: more intensive nitrosating reagents were required. These reactions could also proceed with nylons. Complete nitrosation of 6.6 nylon could be effected with N_2O_3 in glacial acetic acid, or N_2O_4 in glacial acetic acid plus anhydrous sodium acetate. At temperatures of 80°C or above, the nitrosated nylon decomposed with evolution of nitrogen to give a polyester:

$$\begin{array}{l} \text{-CO - NH -} \\ \quad\downarrow \\ \text{-CO.N = N -} \\ \quad\downarrow \\ \text{-CO.O -} \end{array}$$

There was some chain scission during the decomposition, probably because of reactions similar to those discovered by White leading to carboxylic acid and olefin formation.

Plans to Double Carbon Black Output

EXTENSIONS to their Avonmouth works have recently been carried out by Philblack Ltd. to increase output of carbon black. This factory is stated to be one of the few in this country producing carbon black from oil by the thermal combustion process in which liquid hydrocarbons are decomposed by high temperatures and the resultant carbon black collected by means of cyclones and filters.

When the works began full production in 1951 it was estimated that the output of 50 million lb. of carbon black annually would save the UK about $5 million annually in imports from the US. Now it is hoped to double this output.

The Avonmouth plants were built for Philblack by Head Wrightson Processes Ltd. with the technical co-operation of the Phillips Petroleum Co. of the US. Crompton Parkinson were responsible for the electrical services.

Overseas News

ENI'S EXPANDING INTERESTS IN ITALIAN NATURAL GAS

PRODUCTION of natural gas by Ente Nazionale Idrocarburi, Italy, companies rose to 146.874 million cu. ft. in 1956—an increase of 28.816 m. cu. ft. (24 per cent) compared with 1955. This represented 93 per cent of Italian production as a whole. Output during the first four months of 1957 reached 59.505 million cu. ft. Total output of liquid and liquefiable hydrocarbons in Italy amounted to 134,828 tons during 1956—an increase of 17 per cent over 1955. This information is given by the directors of ENI in their annual report.

In 1956 the ENI group distributed a total of 153,125 million cu. ft. of natural gas—equivalent to 97.2 per cent of Italian consumption as a whole. According to the report two small units of ENI's fleet are equipped for the transport of liquefied petroleum gas which were taken into service during 1956. Under construction at present is another small unit for the transport of liquefied petroleum gas.

The gasoline extraction plant at Cortemaggiore processed in 1956 34,926 million cu. ft. of natural gas and produced 59,120 tons of liquid and liquefiable hydrocarbons.

Work continued during 1956–57 on the petrochemical plant at Ravenna which is to produce initially 35,000 tons of synthetic rubber annually. Later 55,000 tons will be produced in the second stage. Production is expected to begin in a few month's time, the report states.

Net profit was 4,585,974,944 lire (£12,292,987 approximately). Of this it is proposed to distribute 687,896,242 lire (£343,948 approximately) or 15 per cent to finance scientific studies and research into hydrocarbons and other sources of power.

AEC Grants Commercial Uranium Production Licence

The first US Atomic Energy Commission licence to a private company to produce enriched uranium metal for commercial use has been granted. The firm chosen is Nuclear Materials and Equipment Corporation. Hitherto the enriched metal has been supplied only by the Federal Government.

Amendment to Australian Sulphuric Acid Bounty

The Australian Sulphuric Acid Bounty Regulations are being amended to provide for the payment of bounty on sulphuric acid produced from the sintering of lead concentrates in Australia from 1 July, 1957. The rate of bounty will be the same as that applied to acid produced from pyrites which for the quarter ended June, 1957, was £A1 13s. per ton of acid.

This extension of the bounty will include in the bounty field Broken Hill Associated Smelters Pty. Ltd., who have recently installed new plant costing £A2 million at Port Pirie in South Australia to produce acid from the gases resulting from the sintering of lead concentrates.

The amendment to the bounty is seen as another indication of the Government's encouragement of the wider use of local materials.

Plastics Production in W. Germany

Production of plastics in West Germany is estimated to total 600,000 tons in 1957, compared with 521,000 in 1956. Total sales by the plastics processing industry for 1957 are put at about DM1,600 million as against DM1,200 million in 1956. Exports are expected to show a slight increase at about 15 per cent of total sales, compared with the 1956 export rate of 14.8 per cent.

South African Phosphate Operations Now Profitable

The Foskor plant at Phalaborwa is now operating profitably for the first time and an average profit of £4,000 a month has been made since July according to the chairman of the company. The entire production of phosphate concentrates is now being taken by African Explosives and Chemical Industries who have declared the quality to be satisfactory. The phosphate mill is being supplied with high grade ore from three quarries and 1,500,000 tons of this ore are available together with further large reserves of low grade ore which will ensure the Union's agricultural requirements of phosphate for a long time ahead.

Urethane Intermediates

A new series of polyol polyether intermediates for the urethane industry has been introduced by Union Carbide Chemicals Co., 30 East 42nd Street, New York 17, US. They are propylene oxide addition products of 1,2,6-hexanetriol, known as Niax. Four polyethers, varying in hydroxyl number from 42 to 240, corresponding to molecular weights from 4,000 to 720, are available.

Canada's First Detergent Alkylate Now on Stream

Detergent alkylate is now being produced commercially in Canada for the first time by Imperial Oil Ltd., who are making initial shipments from their plant at Sarnia, Ontario, just completed at a cost of $5 million. The new plant will produce 30 million lb. of the alkylate a year, enough to supply the needs of Canadian soap manufacturers. Until now the product has been imported from the US at the rate of about $2,500,000 worth a year.

With the new plant in production, Imperial Oil becomes a direct producer of petrochemicals. Their Sarnia refinery—Canada's largest—is the hub of a major petrochemical expansion, of which the detergent unit is the first to come on stream. A second and larger step into direct petrochemical production will come next summer when, on completion of a $28,500,000 unit, the company starts making a wide range of basic chemicals for Canadian industry.

Since their development after world war 2, synthetic detergents have captured an increasingly large share of the Canadian soap market—from 12 per cent in 1948, to 46 per cent in 1955 and an estimated 67 per cent is expected by 1961.

Shell's Geelong Refinery Uses Magnesia Insulation

For insulation at the new bitumen plant at the Shell Refinery at Geelong, Victoria, Australia, magnesia manufactured by James Hardie and Co. Pty. Ltd. has been employed. Capacity of the bitumen plant, which began operating in September last year, is 50,000 tons a year.

The magnesia, as moulded blocks of 85 per cent magnesia, is used for insulation on the bitumen blowing unit, the sides and tops of the 1,500 tons intermediate storage tanks, the run down lines to the bitumen handling area and on all steam lines. More than three miles of piping has been insulated, the company state.

Dow to Boost Production of Chelating Agents

Plans to increase output of its Versene chelating agents have been announced by the Dow Chemical Company, Midland, Michigan, US. A new plant is expected to come on stream at Dow's Texas division during 1958.

At the same time, the company has introduced on the market a new chelating compound, Versenol Z, designed for curing zinc deficiency in avocado orchards and deciduous trees.

Conversion of Gasification Liquor into Harmless Effluent

A Russian investigator, V. A. Peremishlin, has published an account of the procedure adopted at the Schekinsk works in Russia where coal is gasified under pressure with oxygen and steam, to convert the liquor from the process into harmless effluent (*Gazovaya Prom.*, 1957, **4**, 11-14).

The first stage is dephenolation with butyl acetate which reduces the total phenols from 4.6 to 0.73 gm./litre and makes possible further purification by biological methods. However, before this is attempted, the liquid is diluted about seven times to produce a suitable concentration for the micro-organisms. The phenol is reduced from 0.11 gm./litre to 0.001 in the effluent which leaves the works.

In the first stage, the liquor after preliminary removal of tar and solids, is washed with butyl acetate in a tower within which the liquids move countercurrent. Steam is blown through the liquor to remove any butyl acetate remaining and is passed back to an earlier point in the treatment line, where it is blown through the liquor to remove some of the hydrogen sulphide and ammonia. The solvent is distilled off to recover the

phenols; the first half of this process takes place at atmospheric pressure, and the second half under a partial vacuum.

In the following table the chemical composition (in gm./litre) is summarised stage by stage:

	Phenol	Ammonia	H_2S	NH_3
Crude liquor	4.6	4.6	0.6	8.6
After butyl acetate wash	0.7	3.7	0.0004	9.6
Final effluent	0.001	NO_3—1.4mg./l. NO_2—40mg./l.		

The phenols recovered comprise 7.7 per cent phenol, 34 per cent cresols, 5.5 per cent xylenols and 53 per cent higher boiling substances. The mixture also contains some 1.5 per cent of butyl acetate, 5 per cent of water and 10 per cent of natural oils.

Australia's Third Quarter Sulphuric Acid Production

Production statistics for the quarter ended 30 September 1957 released by the Sulphuric Acid Executive Committee, Department of Defence Production, Commonwealth of Australia, are as follows:

Sulphuric acid production (mono-tons)	Qtr. ended 30/9/56	Qtr. ended 30/6/57	Qtr. ended 30/9/57
Ex Brimstone	85,385	132,654	116,058
,, Pyrites	63,130	77,846	72,408
,, Zinc concentrate ...	23,563	25,939	29,411
,, Spent oxide	3,514	3,430	3,420
,, Other materials ...	14,302	15,065	18,507
Process chamber	97,676	150,091	129,770
Contract	92,168	104,834	110,034
Total Production	189,844	254,925	239,804

Acid manufacture (tons)	Qtr. ended 30/9/56	Qtr. ended 30/6/57	Qtr. ended 30/9/57
Brimstone	27,786	45,446	39,674
Pyrites	51,692	65,369	58,614
Zinc concentrate	31,120	33,244	38,330
Spent oxide	3,596	3,532	3,476
Other materials	73,186	65,403	74,683
Consumption (tons)			
For acid manufacture ...	27,786	45,446	39,674
For other uses	2,647	1,595	1,837
Superphosphate (tons)			
Made	396,465	592,002	528,578
Sold	98,548	689,108	188,971

Australian Company's Ammonium Sulphate Production

Ammonium sulphate production by the Electrolytic Zinc Co. of Australia has been increased at the company's Risdon plant and is now at the rate of 58,000 tons per year. The plant, which cost £A4 million, has been in operation a year. Its output is mostly taken up by the sugar-growing areas of Queensland, but some has been exported to India and Ceylon.

New Seriom Factory

Seriom are building a new factory at San Giovanni Valdarno, which will produce fertilisers, special flours for food for animals, and margarine.

26 Per Cent Increase in Swiss Chemical Exports

Swiss chemical exports for the nine months ending 30 September 1957 totalled 870 million Swiss francs (£713,000), an increase of about 20 per cent over the same period of 1956, says the annual survey by Credit Suisse, Zurich. The increase between 1955 and 1956 was only six per cent.

Twenty-six per cent of the total was due to dyestuffs and 45 per cent pharmaceuticals. Exports of pharmaceuticals are expected to develop satisfactorily during the current year.

Favourable conditions existed in the Swiss plastics industry although the large number of small firms engaged in the plastics moulding industry has resulted in unsatisfactory price conditions in this sector.

Developments in China

Work has begun on a chemical plant at Taiyun in North China. It is to produce sulphuric and hydrochloric acids, caustic soda, liquid chlorine, phenol, indigo, 666 and DDT. Annual production of phenol is planned to be sufficient to make 8,000 tons of Kapron synthetic fibre a year.

Construction of two other plants in the same district will begin next spring, a chemical fertiliser plant for ammonium sulphate, etc., and a pharmaceutical plant for various kinds of drugs including sulfa drugs and vitamins.

All these factories are being designed and built with Soviet assistance.

Satisfactory Results for Dutch Superphosphates Firm

Results of the Albatros Superfosfaatfabrieken NV, Utrecht, for the financial year to the end of April 1957 are described as satisfactory, although lower than in the previous financial year. Turnover amounted to fl.78½ million (£7.85 million) against fl.71½ million (£7.15 million) and the gross profit was fl.7.2 million (£720,000) as against fl.7.8 million (£780,000). A dividend of 7 per cent (8 per cent) was paid out of the net profit of fl.1.27 million (£127,000) as against fl.1.46 million (£146,000) in the previous year.

Compared with the previous financial year, there was a slight increase in superphosphate output. Because of large stocks of double superphosphate a low output sufficed and enough phosphoric acid could be released for the greatly increased production of mixed fertilisers. Sulphuric acid output was stepped up during the year.

A decline in exports of superphosphate occurred chiefly because an order to a South African concern was not repeated. Sales of mixed fertilisers, however, showed an upward trend in both home and export markets.

Construction started during the year under review of a superphosphate and mixed fertiliser works in the Union of South Africa. Additional plant was installed at the company's factories at Pernis, near Rotterdam, and at Amsterdam.

Eastman Introduce New Seven Carbon Aldehyde and Alcohol

A new seven carbon aldehyde (2, 2-dimethyl-4 pentenal) and its corresponding saturated alcohol (2, 2-dimethyl-pentanol) have been announced by Eastman Chemical Products, Inc., Kingsport, Tennessee, US, which is now producing both in research and pilot plant quantities.

In a technical report covering the two new compounds, Eastman note the absence of hydrogen on the alpha carbon atom in the alcohol molecule and suggest that it be investigated as a terminating agent for polyesters or in other reactions where dehydration stability is required. The presence of the neopentyl configuration is also noted and the alcohol suggested for application where heat stability is needed.

New Factory for Sandoz

Sandoz of Switzerland are reported to have invested a further 1.3 milliard Italian lire in their Italian branch, Sandoz SA, of Milan, for the establishment of a new chemical factory at Paderno Dugnano.

Montecatini May Co-operate in Israel's Phosphates Industry

It is reported that Mr. Meusche Bader, director general of the Israeli Ministry of Development, will shortly visit Milan to sign an agreement with Montecatini whereby a joint Italo-Israeli company will be formed to exploit the large Israeli phosphates deposits.

SEARCH FOR CHEMICALS STABLE AT HIGH TEMPERATURES

CURRENT US projects in high temperature polymers and fluids were discussed at a recent two-day conference sponsored by the Air Research and Development Command's Wright Air Development Centre and the University of Dayton. In the near future aircraft will require lubricants, hydraulic fluids, plastics and elastomers capable of withstanding 1,000°F.

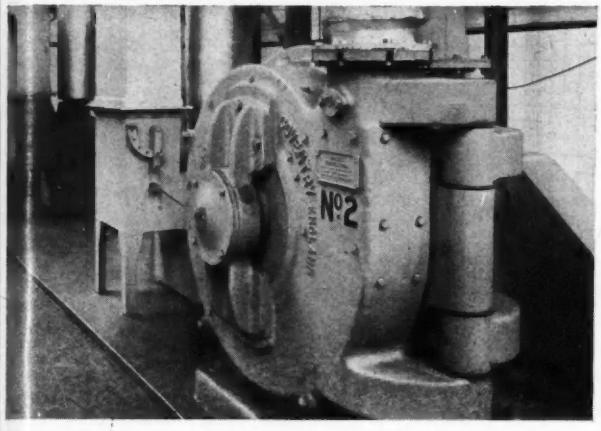
The polymer section of Wright Air Development Centre is at present interested in organo-metallic compounds. Tin and silicon polymers as well as high heat distortion epoxy resins are being studied and advanced tests are now being carried out on two tetra-substituted alkylsilanes as hydraulic fluids.

Other research is concerned with fluoratkylsilanes and ferrocene-based compounds. This latter project is believed to have considerable potentialities. Trialkylsilyferrocenes are claimed to have a liquid range over 1,000°F. with good heat resistance, owing to the stable ring structure of ferrocene.

American Potash are investigating phosphinoborine polymers and Ethyl Corporation are examining siloxane polymers in which some of the silicon has been replaced by tin. Stannosiloxane materials are considered by the company to have real promise as organotin additives and have already proved successful in lubricants. The Sn–O bonds have high thermal stability.

Polyester resins combined with maleimide are under test by Naugatuch Chemical. Difficulties in making maleimide have been overcome by its preparation using new synthesis routes. Results of tests for heat resistance and strength of several polyester copolymers containing 10 per cent to 25 per cent maleimide are stated to be good. In particular, glass fibre laminates made from maleimide—styrene copolymer is reported to have green strength of 64,000 p.s.i. Heated at 500°F for a week, flexural strength was over 36,000 p.s.i.

NEW PULVERISED COAL PROCESS CAN USE LOW-GRADE FUEL



Atritor dryer-pulveriser installed behind the boiler at the Lutterworth works

FIRING of boilers by pulverised coal is considered to have many advantages over other methods, and the Coventry firm of Alfred Herbert Ltd. have installed a new boiler house at their Lutterworth works to demonstrate the operation of the Atritor dryer-pulveriser, used for firing shell-type boilers.

Economic, Lancashire and watertube boilers of all kinds are suitable for firing by pulverised fuel; at the Lutterworth works, two 21 ft. by 9 ft. Davey Paxman Double Pass 'Economic' boilers have been installed. They are fired by Ellistown nuts or doubles, but if necessary virtually any grade of coal above 18 per cent volatile could be used. A Duplex crusher, capable of handling 6-in. down coal and reducing it to ½ in. at the rate of 10 tons an hour, discharges into an elevator which delivers it to twin 20-ton overhead bunkers. The raw coal discharges through an offset chute into the Atritor feeder which is controllable from the front of the boiler by a rheostat. The coal leaves the feeder at the required rate and enters the ascension tube, where it is partially dried as it is conveyed by a stream of hot gas into the Atritor. The hot gases for drying are taken from the combustion chamber at the back of the boiler.

Final drying of the coal takes place inside the Atritor, at the same time as the coal is pulverised to its requisite fineness. It is then blown by an integral fan to the two multi-jet boilers inside the boiler flues where combustion takes place. The Atritors have a capacity of 2,000 tons of coal an hour and are situated at the rear of the boiler, leaving a clear firing aisle. Secondary air for correct combustion is provided at the burner.

Parry soot blowers in the burners keep the flues clean and Clyde blowers in the rear of the combustion chamber clean the back plate and return tubes. Grit from the flue gases is collected in two Pratt Daniel arresters and passes to a brick stack 6 ft. diameter by 100 ft. high. The boilers are instrumented by a George Kent panel. A feature of the Lutterworth installation is the cleanliness of the boiler house.

Advantages claimed for the Atritor dryer-pulveriser over other methods of firing is its ability to deal with wet coals without the aid of expensive external dryers by sending the coal through an ascension tube with hot gases from the combustion chamber. It can also handle low-grade fuel; a Lancashire boiler fired with slurry containing 25 per cent moisture and 25 per cent ash has given evaporations of 11,000 lb. an hour. Although pulverised coal firing involves a greater initial cost than stoker or oil firing, Alfred Herbert consider that savings of up to 25 to 30 per cent on fuel bills can be maintained.

Canadian Plastics Machine Company Formed

ONE of the world's largest makers of machinery for the plastics industry, R. H. Windsor Ltd. of England, announce the formation of a wholly-owned Canadian subsidiary, R. H. Windsor of Canada Ltd. Head office will be in Toronto and for the time being the Canadian company will import from the parent company's main factory in England.

Sixty per cent of the entire Windsor production is now exported from England into 38 countries. Many of the machines are used in Canada. Windsor injection moulding machines are produced in 12 different types; many are completely automatic and virtually cover the entire requirements of the world's plastic industry. This machine is also well known in the extrusion field and makes five different models of plastics extruders.

Arthur G. Dennis, LL.M., chairman of R. H. Windsor Ltd. is chairman of the Canadian company, while R. E. G. Windsor, managing director, is president, D. A. McIntosh, Q.C. and Ross Blair, C.A., both of Toronto, are directors and respectively secretary and treasurer. C. N. Baker, F.C.A., a member of the parent board, is also a director.

Manchester RIC Officers Re-elected

GROWTH of the Manchester and District section, Royal Institute of Chemistry, was referred to at the annual meeting on 8 January. The various meetings had been well attended, and the section was continuing to exert an important influence in the area by the quality and standard of its activities and lectures generally.

The recent exhibition (see CHEMICAL AGE, 4 January, page 15) Dr. R. E. Fairbairn the hon. secretary revealed, had been the best-attended so far as they could gather, to date. It was now a recognised event in the annual calendar. In expressing the thanks of the section to all who had assisted in making this a success, Dr. Fairbairn mentioned the co-operation which they received from the College of Science and Technology, where this event was held.

At the annual meeting of the Manchester and District section, RIC, l to r: R. Shackleton (Magnesium Elektron Ltd.; assistant hon. secretary), Dr. R. E. Fairbairn (ICI Ltd.; hon. secretary) and Dr. S. J. Fletcher (Magnesium Elektron; chairman)

Dr. S. J. Fletcher, chairman, spoke of the support which he had received from his fellow officers. In particular he referred to the developments which had taken place in regard to contacts with parents' associations in the area and also in headmasters' and headmistresses' associations. By close contact with the scholastic profession they were assisting in making the profession of chemistry more attractive to young people who were perhaps undecided about a future career.

Manchester was the largest section of the institute outside London, stated the annual report, and pleasure was expressed at the decision of headquarters to hold the first anniversary meeting of the RIC in Manchester in 1959.

Dr. Fletcher was unanimously re-elected for a second year as chairman and Dr. Fairbairn unanimously re-elected hon. secretary. Mr. F. W. Thomas was unanimously re-elected hon. treasurer.

Elected to the committee were: Mr. P. M. Shaw, Mr. R. Harrison, Professor Haseltine and Mr. J. A. Cundell.

Chemist's Bookshelf

VACUUM TECHNIQUES

PRESSURE MEASUREMENT IN VACUUM SYSTEMS. By *J. H. Leck*, The Institute of Physics, London, 1957, pp. 144. 30s. (Published on behalf of the Institute by Chapman and Hall Ltd.)

In recent years vacuum techniques have intruded into a large number of processes, stimulated to a considerable extent by the requirements of such new enterprises as the development of atomic energy. Vacuum in the chemical field had been mainly concerned with absolute pressures in the mm. Hg. range but new developments in chemical engineering and many of the common analytical tools used in chemical investigations are going right into what is called the high vacuum range of pressures. With the development of these new processes comes the requirement for automatic control to make them economically feasible and clearly the pressure sensing device is all important. Another instance of the growth of the subject is that for the first time a book has been published which is exclusively devoted to low pressure measurement.

Vacuum Gauges

Commonly used vacuum gauges are reviewed in the first four chapters with equal emphasis on the theoretical background and practical aspects of gauge design. Liquid manometers, the McLeod gauge and diaphragm manometers are first discussed. The measurement of vapour pressure is mentioned but one may be disappointed in the lack of completeness in the discussion of this all-important subject. Thus Hickman's method is mentioned but the ingenious effusion manometer of Balson or any of the other methods is not.

Also in this connection the use of a cold trap as mentioned on page 20 can lead to errors if the vapour pressures are at all considerable.

Thermal conductivity gauges are next considered with an analysis of the heat transfer from a heated wire. In spite of the very detailed and careful treatment of this topic there are still a number of important gaps and a lack of completeness. Thus certain aspects of thermocouple gauges, the possible use of small beads of semiconductors such as 'thermistors,' the use of thermal expansion effects for pressure switches or the bimetal gauge are not mentioned at all.

Viscosity gauges are also not considered being apparently 'primarily of historic interest.' In fact the vibrating reed type of viscosity gauge is used for certain specialised work while an industrial version of the Dushman motor-driven mill type of gauge is manufactured by a well-known US firm. Ionisation gauges especially the hot cathode thermionic types are again carefully treated though I would not be in perfect agreement with all details. Again there is an omission by not dealing with the common discharge tube which is after all a form of cold cathode ionisation gauge without magnetic field.

The next chapter discusses the Knudsen gauge in great detail and while it is agreed that this much neglected instrument is more important than is commonly realised, one could also say that at least some of the discussion in this chapter is of only historical interest.

Surface reaction techniques including the flash filament method and the field emission microscope are very briefly reviewed and this is valuable because these subjects have received considerable renewed interest lately with the development of the ultra high vacuum techniques of Alpert. It is now possible to obtain and measure these very low pressures quite readily and thus open up a number of new lines of research into the physical and chemical behaviour of 'clean' surfaces.

The book concludes with a discussion on gauge calibration. The all-important related subject of testing for and locating leaks in vacuum systems has not been touched on. Switching devices actuated by changes in pressure, so important in control systems, have only been mentioned incidentally in the text. The chief criticism then is that the book does not deal with all the things one might associate with the title.

Nevertheless we must be grateful to the Institute of Physics for having encouraged the writing of a specialised book such as this. On the whole it deals very competently with the various aspects of pressure measurement in vacuum systems selected. It can be recommended to those who require a deeper understanding of the subject.

W. STECKELMACHER

Students' Handbook on Analysis

A STUDENT'S HANDBOOK OF ORGANIC QUALITATIVE ANALYSIS. By *J. B. Bowen, S. H. Graham* and *A. J. S. Williams*. University of London Press, London. 1957. Pp. 189. 15s.

One of the numerous interesting problems in teaching chemistry in the university and the technical college concerns the relationship between the lecture and the laboratory, between theory and practice. A course in organic qualitative analysis is one way of bridging the gap between these two indispensable parts of the syllabus.

The field, however, is so large that some selection of topics is essential. The authors of this book have restricted it to mono- and di-functional compounds, together with the carbohydrates.

It contains much useful detailed practical instruction, including a particularly satisfying treatment of the Lassaigne sodium fusion test. Simple group tests (based on solubility and hydrolysability) are early established, and lead on to a discussion of the reactions of typical compounds.

Among the unusually interesting methods employed are the characterisation of aldehydes by means of dimedone and of the aromatic hydrocarbons by means of their anthraquinone condensation products.

Commendable attention has been given to the identification of the acetals and to establishing the most suitable laboratory conditions for successful nitration.

Only passing reference is made to those important principles of physical chemistry which underlie so much practical organic work.

The book is eminently practical, a true companion for the laboratory bench. Useful tables of melting points and boiling points are included for the commonest substances likely to be encountered in the usual second-year course.

It is surprising, therefore, to find no reference to the writing up of organic analyses. An adequate account, clearly and concisely written, is as important as the analysis itself. A short discussion, illustrated by model analyses, of the various suitable ways of writing up would have added considerably to the value of this useful handbook.

J. K. STUART

Survey of Industrial Catalysts

CATALYSTS IN PRACTICE. Edited by *C. H. Collier*. Rheinhold Publishing Corp., New York, 1957, pp. 153 and IV. $3.95.

This work is a collection of seven papers given at a one-day symposium in Philadelphia, sponsored by the AIChE. With due regard to the pocket-size of the book, it presents a remarkably good survey of catalysts in industry and at the same time provides sufficient quantitative information both on catalyst characteristics and system operation to make the book a useful acquisition to workers in the field, as well as students.

Occupying one third of the book, the first chapter deals briefly but well with the mechanism of surface catalysis and the effect of catalyst size, porosity and pore radius on catalyst activity. The four types of continuous catalyst system used commercially are compared. The significant characteristics of catalysts are discussed and catalyst life is related to poisoning and attrition is linked with cost factors leading to determination of choice in industrial use.

The second chapter deals with the commercial preparation of industrial

catalysts and will probably be of secondary interest to operators of catalytic processes. The third chapter is concerned with fixed bed catalyst systems dealing largely with heat removal problems, while the fourth chapter discusses moving bed processes. The next two chapters on the economics of catalyst use and operating problems contain generally useful information while the short concluding chapter on trends and prospects predicts important developments in the field of stereo-specific catalysts and their use, as well as the use of catalysts in nuclear reactions.

The fact that the book is based almost exclusively on US practice will actually be an advantage to readers in this country and it is recommended.

D. C. FRESHWATER

COURSE IN ANALYSIS OF ORGANIC COMPOUNDS

QUANTITATIVE ORGANIC ANALYSIS. By *J. S. Fritz* and *G. S. Hammond*. John Wiley and Sons, New York. Chapman and Hall, London. 1957. Pp. xiv + 303. 57s 6d.

This new book from the US is intended to provide a course 'in the analysis of organic compounds by selective group reactions at the later undergraduate or beginning graduate level'.

The major portion is devoted to a critical discussion of the wide variety of methods which are available for organic analysis. The many references include European as well as American journals. Illustrative examples have been selected partly from work done by the authors at Iowa, and partly from current chemical practice. For example, basic impurities in refined hydrocarbon oil have been determined by titration with perchloric acid in non-aqueous media.

Manometric measurements involving the evolution of hydrogen, nitrogen, nitrogen oxides and carbon dioxide are applicable to a wide variety of analytical problems in organic chemistry. Chromatography has been elegantly applied to the separation (on silica gel) of the mono- and the dicarboxylic acids, and also to the separation and estimation of organic acids in cured tobacco.

Tracer dilution, spectrophotometry, polarography and reaction kinetics are some of the other methods discussed.

The concluding chapter, 'Laboratory procedure', contains many of those practical laboratory determinations usually included in undergraduate courses in this country, e.g. the determination of hydroxyl by acetylation and of unsaturation by means of bromine. It also includes some more unusual estimations, such as the titrimetric estimation of sulphur by means of barium perchlorate (using thorin as indicator) and the kinetic analysis of a mixture of tertiary halides.

The wide field covered, the critical approach and the clear interesting style will appeal to a wide variety of chemists, including final honours men, research students, and all those interested in organic analysis.

J. K. STUART

Chemist's Bookshelf

Sugar Technology

TECHNOLOGY FOR SUGAR REFINERY WORKERS. By *Oliver Lyle*. Third Edition Revised and Enlarged. Chapman and Hall, London, 1957, pp. 663. 70s.

Any book from such a distinguished authority on sugar technology and fuel economy must create enormous interest in the field of technical literature. In the second edition (1949), the author modestly referred to the parochial nature of the book, whereas in fact, it had a world-wide appeal and is now a classic in every sugar producing country. This third edition is revised, re-arranged, enlarged and the text is well supplemented with 114 illustrations. The indexing is exemplary, being simple, accurate and fast. Reference to 635 subjects is made easy by a full clearly subdivided section index.

The new edition provides a lucid and authoritative work on sugar technology and chemical engineering principles and covers much more than the title would indicate. To the sugar technologist it contains a vast field of technical information and scientific knowledge gained over many years of experience and research. It is an unusual work with a dual role, being a comprehensive reference book for the expert but written in such a meticulous and logical style that it is also a text book for the student in chemical engineering.

It disposes of the accusation that the scientist is dull as throughout there is a vein of scientific humour, and it is the kind of book which when referred to for a single fact, may still be in the reader's hands a few hours later.

The 24 chapters cover: Sugar (sources), measurement, chemistry, sugar analysis, heat and steam, steam boilers, electricity production and use, pumps, centrifugals, vacuum pans, evaporators, filtration, char recovery, sugar balance, drying, ridding, cooling and packing; handling and storage; specialities, the heat balance; losses, savings and control; the planning and interpretation of experiments, commercial, sugar (properties). Several chapters specialise in sugar technology, but 15 of the 24 are of direct interest to all chemical engineers. Chapter 18, on the handling and storage of materials, is specially commended as it contains valuable information on the various types of plant. Although the author's arguments are logical, not all sugar technologists will agree with the maximum capacity given for bulk white sugar silos.

Chapter 22 deserves special attention, being devoted to the planning and interpretation of experiments. It is an excellent concept of statistical reasoning emphasising several techniques and their rational interpretation. This chapter merits serious study by all engaged on experimental work.

By any standard, this book is an outstanding achievement and the author and his colleagues are to be congratulated on its production. Sir Oliver Lyle's approach to his task is a model of scientific endeavour and presentation. To the technologist and chemical engineer it is almost indispensable and must be highly recommended. At 70s it is excellent value and should be bought, borrowed or otherwise acquired.

HENRY ELLIOTT

HALOGENATED HYDROCARBONS

SOURCE BOOK OF INDUSTRIAL SOLVENTS. Vol. 2. Halogenated Hydrocarbons. By *Ibert Mellan*. Reinhold Publishing Corporation, New York; Chapman and Hall Ltd., London. 1957. Pp. 267. $7.00.

Since the publication of the first volume of this series, which was issued under the main title 'Handbook of Solvents', there appears to have been some confusion with other books in the same field. Consequently it has been decided to rename the series 'Source Book of Industrial Solvents'. The title of the first volume was 'Pure Hydrocarbons', an interpretation meaning solvents containing only hydrocarbons and not as might be imagined pure chemical substances. The three groups of hydrocarbons dealt with were the aliphatics, aromatics and terpenes.

There are five sections in the present volume, the first of which covers in a few pages the general properties of the halogen family of elements, and the manner in which the halogen atoms can be introduced into organic compounds. The three largest sections deal with the hydrocarbons containing fluorine, chlorine and bromine. The concluding section on iodinated hydrocarbons is very brief. The author has continued his practice of using commercial and proprietary names where possible in place of chemical nomenclature.

A wide variety of the properties of the solvents are listed in tabular form, with the solvents classified in accordance with their distillation range. The book itself is designed to appeal to the technical personnel engaged in the manufacture and applications of solvents of American origin. The book also contains a certain amount of interesting material dealing with the background to halogenated hydrocarbons, which should appeal to readers in general.

G. S. EGERTON

Chemist's Bookshelf

Ion-Exchange Techniques

ION-EXCHANGE RESINS. By *J. A. Kitchener*. Methuen and Company Ltd., London. 1957. Pp. vii + 109. 9s 6d.

Few techniques have expanded more rapidly than that of ion-exchange. From humble beginnings as an analytical tool it has developed, in recent years, into an important branch of physical chemistry without decrease in its analytical significance. Despite the great current interest in, and importance of, the subject, however, a limited number of books are available which clearly emphasise the physical-chemical developments of ion-exchange.

One of the best surveys of the physical-chemical approach to the subject is Samuelson's book, 'Ion-Exchangers in Analytical Chemistry', which appeared in 1953. Since that date, however, progress has been rapid and therefore a book which describes the more important findings of recent research work is to be welcomed. Such a book is the one under review. It is a short monograph in which obvious care has been taken to give a concise, selective account of the basic principles of the subject. It is the most recent addition to Methuen's Monographs on Chemical Subjects and, it can be said immediately, that it is well up to the standard found in the series. The author is reader in physical chemistry at Imperial College.

The book contains six chapters. In the first, Dr. Kitchener traces the development from cation-exchange in natural silicates to natural organic exchangers. This is followed by a historical account of the development of the synthetic organic exchangers of Adams and Holmes with emphasis on the preparation of these polymerisation resins, concluding with a table of the principal modern resins, their functional groups, and characteristics.

Chapter 3 deals with the physical chemistry of exchange equilibria. In this chapter the author gives an excellent and clear account of a very difficult subject. From the formal thermodynamic treatment of equilibria he leads on to the approach through the Donnan equilibrium and Gregor's swelling energy theory showing very clearly that a more refined treatment of ion-exchange and selectivity coefficients must include elements of both views.

Kinetics of ion-exchange are next considered and, once again, the author has managed to produce accounts of the mechanism of exchange, film diffusion and particle diffusion kinetics and the kinetics of column processes which can be clearly and readily understood.

In chapter 6 applications of ion-exchange resins are discussed. These include the preparation of pure water, the extraction and concentration of uranium from low-grade ores, separations of the rare-earth elements, the transuranic elements, amino-acids, peptides and proteins, and the use of resins to study the existence of complexes in solution. In the final chapter recent developments such as highly selective resins, redox resins, and ion-exchange membranes are treated.

In all but the sections dealing with equilibria and the kinetics of ion-exchange, treatment is not detailed but a selection of well-chosen literature references, some as recent as 1957, at the end of each chapter enable an interested reader to pursue his reading further.

It might be claimed that among recent developments, ion-exchange in non-aqueous systems and ion-exchangers as catalysts could have been included in view of their current interest; however, considering the very wide field of application of ion-exchangers and the enormous amount of literature published on the various aspects of the subject, the author has produced a very useful book which should be of particular use to students in advanced classes at university and chemists employed in one of the many fields in which ion-exchange principles and techniques can be used. The reviewer has no hesitation in recommending it.

R. J. MAGEE

Chemical Engineering in Food Processes

PROCESS ENGINEERING IN THE FOOD INDUSTRIES. By *R. J. Clarke*. Heywood and Co. Ltd., London. 1957. Pp. viii + 354. 60s.

The author, a chemical, or as he would prefer it, a process engineer, wisely refers in his title to the food industries in the plural. Thus informed the reader cannot expect to find all that he seeks in the 350-odd pages available for consideration of all the unit operations and processes used by the food manufacturer. The author also states in his preface that 'the slow introduction of the disciplines of chemical engineering to this field is due to the complex nature of foodstuffs'.

This factor still operates in this book to the extent that the emphasis is placed on the process, and the products frequently receive scant treatment except for such well-defined processes as milk treatment or sugar refining. The food technologist will find much of value to him in this book for he should already be fully acquainted with the nature and behaviour of his raw materials and, thanks to the subdivision of the contents into unit operations and processes, and the availability of a useful index, references to published work and a bibliography, should have little difficulty in adding considerably to his knowledge of process engineering in the food industries.

F. H. BANFIELD

Catalysis Conference Recorded

ADVANCES IN CATALYSIS. Volume IX, Proceedings of the International Congress on Catalysis, Philadelphia, Pennsylvania, US, 1956. Edited by *A. Farkas*. Academic Press Inc., New York, Academic Books Ltd., London. 1957. Pp. xviii + 847. 114s 6d.

As the title implies this volume of 'Advances in Catalysis' differs substantially from earlier volumes in the series. It contains over 80 papers which were presented at the International Congress on Catalysis in Philadelphia in September 1956, together with a fairly full record of the discussion which occurred at that meeting. The majority of the papers fall into the category of heterogeneous catalysis and related subjects such as adsorption, studies of the nature of catalysts and techniques of importance in heterogeneous catalysis. However, there is also a section containing a dozen papers on various aspects of homogeneous catalysis varying from the action of enzymes to the catalytic reactions of simpler inorganic and organic molecules in solution.

The types of papers recorded in the volume fall into two categories. The majority are, on average, less than 10 pages in length and deal mainly with specific research problems. Naturally, there is considerable variation in the standard and the importance of these contributions, but they are valuable because they represent the type of work which is being carried out in heterogeneous catalysis in different research schools in a wide range of countries. The second category of paper comprises the rather longer papers of those who were invited to contribute at greater length to the congress. Although there is some diversity in the character of these longer contributions, they are of a uniformly high standard and they serve to give a cohesion to the volume which otherwise might appear to be rather a conglomeration of individual papers.

This volume is undoubtedly of the greatest importance to all those interested in heterogeneous catalysis. Most of the papers are in English, although there are a few in French and German. The editor and his assistants deserve congratulation on the way in which the volume is produced. There is an excellent author index and a shorter subject index which is really a classified index of the contributions and which serves to indicate the wide scope of the book.

C. KEMBALL

Diary for Fuel Engineers

INDUSTRIAL FUEL EFFICIENCY DIARY FOR 1958. Edited by *H. B. Locke*. H. O. Quinn Ltd., London. 12s 6d.

Mr. Locke has attempted in the space of a normal sized diary to include a range of information of value to engineers and fuel technologists. There are about 90 pages of tables, diagrams and formulae related to fuel usage, together with usual calendars, postal information, etc.

It occurs to the reviewer that in future issues the maps could be left out and more valuable information put in their place; e.g. a summary of the various Acts and laws which apply to the industrial use of fuel, together with lists of important organisations such as the National Industrial Fuel Efficiency Service.

J.P.S.J.

PEOPLE in the news

● MR. E. PEARSON has been appointed assistant sales manager of Fielden Electronics Ltd. Before his promotion Mr. Pearson combined the duties of textiles instrument division manager with that of north west area sales supervisor. He is now responsible for all internal and external staff associated with the sales department. MR. G. ENSOR, general manager of the company, has now resumed the office of sales manager.

● MR. MICHAEL P. RENAUD has been appointed to the foreign sales office in Zurich, Switzerland, of the Dow Chemical International Ltd. Born in Paris, Mr. Renaud has studied chemical engineering and business administration in the US. He has been with Dow since 1955.

● DR. B. V. BOWDEN, principal of the Manchester College of Science and Technology, is one of the new members starting a four-year term on the BBC North Region Advisory Council.

● MR. C. N. FORD, works manager and MR. S. H. A. HIRSCH, B.Sc., F.R.I.C., technical sales manager, have been appointed to the board of Vinyl Products Ltd.

● MR. RONALD JOHN KERR-MUIR and MR. ARTHUR WILLIAM KNIGHT have been appointed directors of Courtaulds Ltd. Mr. Kerr-Muir, who is 47, joined Courtaulds in 1946, becoming a director of the chemicals division in 1950. In 1954 he

R. J. Kerr-Muir who has joined the board of Courtaulds

was appointed executive vice-president of Courtaulds (Canada) Ltd. He has only recently returned from Canada. Mr. Knight, aged 40, joined Courtaulds in 1939. Since 1946 he has been mainly concerned with overseas interests and is a director of various overseas companies including Les Filés de Calais (France), Courtaulds (Canada) Ltd. and Novaceta (Italy).

● DR. A. D. MERRIMAN, formerly secretary of the Institution of Metallurgists, has been appointed consultant on scientific projects to Edgar Allen and Co.

● MR. J. A. COCHRANE, deputy chairman of James A. Jobling and Co. Ltd., has joined the board of Q.V.F. Ltd., of Stoke-on-Trent.

● SIR CYRIL HINSHELWOOD, president of the Royal Society, has appointed the following vice-presidents for the year ending 30 November 1958: SIR WILLIAM PENNEY, director of the Atomic Weapons Research Establishment, Aldermaston; SIR LINDOR BROWN, Jodrell Professor of Physiology in the University of London; SIR CHARLES DODDS, Courtauld Professor of Biochemistry in the University of London; and SIR BRYAN MATTHEWS, Professor of Physiology in the University of Cambridge.

● MR R J. KINGSNORTH has recently been appointed manager of the process control division of Elliott Brothers (London) Ltd., a member of the Elliott-Automation Group. Mr. Kingsnorth has been connected with the electrical instrument industry for over 25 years, and for the past 17 years has been manager of the Erith Instrument factory of Salford Electrical Instruments Ltd.

● MR. PERCY SMITH, general sales manager of Bakelite Ltd., has been appointed a director to fill the casual vacancy caused by MR. C. C. LAST'S resignation.

● THE DUKE OF EDINBURGH is to visit the headquarters of Monsanto Chemicals Ltd. at Monsanto House, Victoria Street, London SW1, on Wednesday, 5 March. He will lunch with SIR MILES THOMAS, chairman, and his co-directors.

● MR. R. SOSBE, 24 Hambleton Road, Heald Green, Cheadle, Cheshire has been appointed Lancashire, Cheshire and North Wales representative by James Gordon and Co. Ltd., Dalston Gardens, Stanmore, Middlesex.

● MR. J. ARTHUR REAVELL, chairman of Kestner Evaporator and Engineering Co. Ltd., and Mrs. Reavell, left Southampton on s.s. *Cape Town Castle* on 9 January for South Africa and a tour of Kestner offices and works. From Cape Town they will travel to Johannesburg, Drakensberg and Durban, returning via Ladysmith. They are expected to arrive back at Southampton on 4 April.

● DR. S. K. KON, D.Sc., Ph.D., F.R.I.C., head of the nutrition department, National Institute for Research in Dairying, Shinfield, near Reading, was re-elected chairman of the biological methods group, Society for Analytical Chemistry at the annual meeting held recently in London. DR. J. I. M. JONES, M.Sc., D.Sc., F.R.I.C., technical manager and research director, Crookes Laboratories, Ltd., Park Royal, London NW10, was re-elected vice-chairman and MR. K. L. SMITH, M.P.S., head of the bioassay division, standards department, Boots Pure Drug Co. Ltd., Nottingham, was re-elected hon. secretary. The meeting was followed by an informal discussion on 'The weighing and measuring of small quantities', opened by DR. G. E. HODSMAN and MR. R. GOULDEN.

● MR. MALCOLM TURNER CLARK has been appointed chief chemist at the Cricklewood laboratory of British Oxygen Gases Ltd., in succession to MR. C. COULSON-SMITH who has retired. Aged 52, Mr. Clark has worked at the Cricklewood laboratory for the past 27 years. His activities recently have been concerned with the production control of acetylene.

Dr. Peter V. Clifton, who as announced last week has joined Sharples Process Engineers as a sales engineer

● MR. T. B. WORRALL, secretary of the dyestuffs division of Imperial Chemical Industries Ltd., has been appointed to the board of the pharmaceuticals division, Wilmslow, Cheshire. Mr. Worrall, aged 47, qualified as a chartered accountant in 1931 and joined the dyestuffs division of ICI in 1940.

● MR. T. E. POTTS has been appointed a managing director of the British Oxygen Co.

Obituary

MR. WILLIAM POOLE, for many years a technical representative with the Geigy Co. Ltd., at their Vincent Street, Bradford, Yorks, branch, has died, aged 65.

Textile Chemists and Colourists to Visit UK

FIRST visit to England by the International Federation of Associations of Textile Chemists and Colourists will be made in 1959 when the host member society will be the Society of Dyers and Colourists.

The congress will be held on 16, 17 and 18 September 1959 with the congress centre at Church House, London SW1. Social events will include a dinner and gala ball, together with tours and special attractions for the ladies.

Petrochemicals—1957 and After

In the article on petrochemicals by Mr. H. P. Hodge in last week's issue of CHEMICAL AGE, page 91, a printing error occurred in the statement about the output of ICI's second petroleum cracking plant. This second plant has a liquid feed throughput of 200,000 tons a year and an estimated output of 30,000 tons ethylene, 25,000 tons propylene and lesser quantities of butylenes and butadiene.

Commercial News

Depreciation and Heavier Tax Leave BIP's Balance Unchanged

ALTHOUGH consolidated profits of British Industrial Plastics rose by £72,500 to £906,248 for the year ended 30 September 1957, the net balance shows little change at £296,073, compared with £296,495 for the previous year. The small change in net balance is due to increased depreciation and heavier tax.

The statement shows also that there is an unrequired tax credit of £10,000. The amount transferred to general reserve has been halved from £300,000 to £150,000.

The final ordinary dividend is being maintained at 12½ per cent thus making 20 per cent for the year, as previously.

Bowmans Chemicals

Increased profit (subject to audit) is announced by Bowmans Chemicals Ltd. for the year ended 31 October 1957. This profit is £18,644 as against £16,622, after tax, £18,539 (£18,644) and depreciation £13,771 (£16,915) but before profits tax £2,330 (£2,241). £10,000 has been placed to general reserve and the figure carried forward is £23,365 (£22,780).

Dividend for the year ended 31 October is 10 per cent (same).

British Dyewood Purchase

Plans for financing the purchase of the US-owned British Dyewood Co. Ltd., Glasgow, were given at the recent annual meeting of Bullough Securities in Manchester.

According to Mr. W. A. Walsh, chairman of Bullough, the deal was negotiated in New York by Singer and Friedlander for £225,000 of which £85,000 would be found by Bullough and the rest by Singer and Friedlander who would raise £90,000 in seven per cent debentures at par and £50,000 from an offer of new Ordinary shares at 4s 6d per 4s unit to Bullough shareholders on a one for five basis.

The meeting voted to increase the share capital of £500,000.

British Glues

Interim dividend of British Glues and Chemicals on account for the year ending 31 March next is unchanged at 5 per cent. A final of 13¾ per cent made the dividend 18¾ per cent for 1956-57.

Turner and Newall

Reasonably satisfactory results for the current year, so far as forecasting is possible under existing conditions, are expected by the directors of Turner and Newall Ltd., the asbestos manufacturers. Aggregate group profit, before tax, was slightly higher for 1956-57—£13,456,905 against £13,343,819, due to substantially improved results of the overseas companies. The dividend is being increased from the equivalent of 13¾ per cent to 15 per cent on capital doubled by a scrip issue.

It is reported that the factories of the Washington Chemical Co. Ltd. operated at high capacity throughout the year with a sales turnover considerably in excess of that of the previous year. Increased costs of production, however, resulted in reduced profit margins whilst export business, although demand was strong, remained very competitive. Good progress was made with the factory modernisation and enlargement schemes, and research work on the company's products and processes proceeded favourably.

W. J. Bush and Co.

Current interim dividend for W. J. Bush and Co. is 2 per cent on increased capital. The corresponding dividend paid during the previous financial year was 2½ per cent. The total dividend paid last year was 16 per cent.

Milton Antiseptic

Net profit of Milton Antiseptic for year ended 30 September was £58,390 (£52,205). Dividend of 18 per cent is proposed on ordinary (13½ per cent).

Morgan Crucible Ltd.

The interim dividend announced by Morgan Crucible Ltd. is 3¾ per cent. This is the same as the interim paid in the previous year. The total dividend paid 1956-57 was 10 per cent.

LONDON GAZETTE

Voluntary Winding-up

PAL CHEMICALS LTD. Resolved on 20 December 1957 that company be wound up voluntarily. Basil Walter Vincent, 53 New Broad Street, London EC2, appointed liquidator.

INCREASE OF CAPITAL

WEINREB AND RANDALL LTD., consulting and chemical engineers, etc., 70 New Oxford Street, London WC1. Increased by £1,900 beyond the registered capital of £100.

NEW COMPANIES

ABRIL INDUSTRIAL WAXES LTD. Cap. £10,000. Manufacturers of wax and chemicals for use in industry, etc. Directors: H. Liss and S. Liss. Reg. office: 76/7 Garnage Buildings, Holborn, London EC1.

AIRKEM (EXPORT) LTD. Cap. £1,000. Importers and exporters of chemical preparations of all kinds for reducing odours, etc. Subscribers: S. E. Reeder and G. A. Hesker. Reg. office: 36 New Broad Street, London EC2.

AQUARIUS (AGRICULTURE) LTD. Cap. £100. Manufacturers, merchants, wholesalers of chemicals, gases, fertilisers, salts, acids and compositions for use in the irrigation of soils, filtering and purifying apparatus and plant, etc. Directors: G. Fisher and A. G. Elliott. Reg. office: 30 St. Ann Street, Manchester 2.

CHEMIPAX LTD. Cap. £100. Manufacturers of and dealers in plastic containers, etc. Subscribers: W. Price and Mrs. D. Price. Reg. office: 19 Gresham Gardens, London NW11.

HOUSEMAN AND THOMPSON RESEARCH LTD. Cap. £10,000. Research of all kinds in relation to substances connected with the manufacture, supply or use of water, chemicals, electric power, light, heat, etc. Directors: E. L. Streatfield, 121 Copsewood Way, Northwood, research chemist, and B. G. Houseman, West Callerton, Ponteland, Northumberland, chemical engineer, and James Mather

MURPHY TRUSTEES LTD. Cap. £ 00. Directors will be appointed by the Murphy Chemical Co. Ltd.

PEAT PRODUCERS LTD. Cap. £2,(00. Manufacturers, importers and dealers in peat, fertilisers, plant food and other organic and chemical products, manures, etc. Directors: R. Spring (director of S. J. Talbot Ltd.) and A. J. Edmond. Reg. office: 20/1 Mariner Street, Swansea.

REX PASTE LTD. Cap. £10,000. Manufacturers of and dealers in glues, adhesives and sizings, etc. Subscribers: Ashley Trading Co. Ltd., 90 Lots Road, West Brompton, London SW10, J. King and G. B. Hutchings.

S. AND CO. (CHEMICALS) LTD. Cap. £100. Manufacturers of and dealers in rubber, rubber compositions, rubber substitutes and compounds, plastics and plastics compounds, chemicals and chemical compounds. Directors: A. Paterson, G. A. Hoy. Reg. office: Downham Mills, Tottenham, London N17.

SOUTHERN FARM CHEMICALS LTD. Cap. £100. Directors: S. G. Fearon-Wilson, R. A. B. Winch, J. A. Usborne. Reg. office: Wilding Farm House, North Chailey, Sussex.

SWALLOWFIELD AEROSOLS LTD. Cap. £10,000. Manufacturers, exporters, suppliers, distributors and vendors of aerosols and allied products, including insecticides, air fresheners, etc. Directors: L. Gregory, R. B. Dawson, J. M. Gregory, P. S. Gregory and H. R. Mole. Reg. office: Swallowfield, Wellington, Somerset.

TONNOX CONSTRUCTION LTD. Cap. £100. Constructors of factories, plant, machinery and equipment for manufacturing and compressing, liquefying and solidifying oxygen, acetylene and any other gases or kindred substances, etc. Directors: F. J. Clark (managing director British Oxygen Co. Ltd.); G. W. Lake, (managing director British Oxygen Engineering Ltd.); A. M. Clark (director, British Oxygen Linde Ltd., etc.); and F. Tweddell (director, British Oxygen Engineering Ltd.). Reg. office: Bridgewater House, Cleveland Row, London SW1.

Fison's Farming Research Grants

Three substantial economic research grants have been announced by Fisons Ltd. These have been made to the Universities of Bristol and Nottingham and the University College of Wales for the study of grassland and investigation of problems associated with Welsh hill farming.

FOR YOUR DIARY

MONDAY 20 JANUARY

Institute of Metal Finishing—London: Northampton Polytechnic, St. John Street EC1. 6.15 p.m. 'Some properties and applications of chemically reduced nickel coatings' by A. McL. Aitken.

RIC—London: Enfield Technical College, Queensway, Ponders End. 7.30 p.m. 'Petroleum chemicals' by S. F. Birch.

RIC—Leeds: Chemistry Lecture Theatre, The University. 6.30 p.m. 'Needles in geochemical haystacks—atomics to the rescue' by A. A. Smales.

SCI, pesticides group—London: 14 Belgrave Square SW1. Symposium, 'Pests of stored products'. Until 21 January.

TUESDAY 21 JANUARY

British Nuclear Energy Conference—London: Hoare Memorial Hall, Church House SW1. Symposium on nuclear energy.

I Chem E—Chester: Blossoms Hotel. 7 p.m. 'Production of boron-10 by distillation of boron trifluoride' by P. Netley.

I Chem E—Manchester: College of Science and Technology. 6.45 p.m. 'Ion exchange as an industrial process' by T. V. Arden.

Plastics Institute—London: Wellcome Building, 183 Euston Road NW1. 6.30 p.m. Discussion, 'European free trade' opened by J. H. Pinder.

WEDNESDAY 22 JANUARY

I Chem E—Birmingham: Chemical Engineering Lecture Theatre, The University, Edgbaston. 6.30 p.m. 'Experiences of an engineer in journalism' by J. O. Macdonald.

I Chem E—Leeds: Chemistry dept., Lecture Theatre, The University. 7 p.m. 'Heat transfer analogues' by N. L. Franklin, G. T. Matthews and J. E. Cook.

SCI, food group—London: 14 Belgrave Square SW1. 6.15 p.m. 'Chemistry of tea manufacture' by E. A. H. Roberts.

THURSDAY 23 JANUARY

CS, RAC & SCI—Aberdeen: Marischal College. 7.30 p.m. 'Some new chemical instruments developed at Harwell' by Dr. R. Spence.

I Chem E—Leeds: Fuel Dept., The University. 7 p.m. Annual Centre Meeting, followed by films shown at Dublin BA meeting.

OCCA—London: Manson House, 26 Portland Place W1. 7 p.m. 'Functions of aluminium complexes as structure modifiers in paints' by J. Turner, S. Hanson and S. Kemp.

SCI, corrosion group—London: Battersea College of Technology, Battersea Park Road SW11. 6.30 p.m. Conversazione. Exhibits of research and development into protective coatings, films, and supper. Exhibition until 24 January, 9.30 a.m.–3.30 p.m.

FRIDAY 24 JANUARY

SAC—Glasgow: Rhul Restaurant, 123 Sauchiehall Street. 1.30 p.m. AGM, followed by 'Micro-organisms in analytical chemistry' by S. A. Price.

SATURDAY 25 JANUARY

SAC—Manchester: Engineers Club, Albert Square, Manchester. 2.15 p.m. AGM, followed by 'Micro-organisms in analytical chemistry' by S. A. Price.

Film on Tubular Engineering

A FILM, called 'Tubular Engineering,' has been produced by Stewarts and Lloyds Ltd. It is a sequel to their earlier film, 'The Tubewright,' and it shows the second stage in the development of the use of the hollow section for structural purposes. The Great Jib, largest walking dragline in the world, the NCB's sea boring tower, and many other tubular structures are shown in this 26-minute film, available in 16mm. or 35mm. sound. Loan of the film is free and a copy is available on application to any Stewarts and Lloyds office. Overseas borrowers should apply to their export department at 41 Oswald Street, Glasgow C1.

TRADE NOTES

A contract worth about £80,000 has been received by Humphreys and Glasgow for the erection of a 3-million cubic feet per day carburetted water gas plant for the West Midlands Gas Board at Etruria gasworks, Stoke-on-Trent. Work is scheduled to start at once and is expected to be completed in 18 months.

Hockley/Lacrinoid Agreement

Hockley Chemical Co. Ltd., 1 Hockley Hill, Birmingham 18, and Lacrinoid Products Ltd., Gidea Park, Essex, have entered into an agreement under which Hockley Chemical become the sole UK distributor of Lacrinoid chips and compounds for use with the Lacromatic barrelling process for metals. Orders should in future, therefore, be addressed to Hockley Chemical.

Tower Packings Agreement

The Hydronyl Syndicate Ltd., 14 Gloucester Road, London SW7, have been granted by the United States Stoneware Co. the sole licence for the manufacture, use and sale of Intalox saddles. This type of tower packings has recently found rapidly increasing application in the US, and is now made by Hydronyl from their well-known Hy-Contact acid-resisting, ceramic body in a wide range of sizes.

De-fibring Cellulose

Lengthy research work by Professor P. Willems, of the Physico-Chemical Research Institute, Lucerne, has led to the development of a kinematic high-frequency technique which continuously and completely defibres cellulose down to the single fibre in a fraction of a second. The professor claims that this can be carried out many times faster than has hitherto been possible. Commonwealth licensees are George Scott and Son (London) Ltd., Artillery House, Artillery Row, London SW1.

Price Changes

Price increases of about 3 per cent for borax and boric acid have been announced by Borax and Chemicals Ltd., 35 Piccadilly, London W1. The new prices, which will be effective from 17 February, are as follows:

			Borax £	Borax s	Boric acid £	Boric acid s
Pyrobor (dehydrated)	paper bags		67	10	—	
	hessian	,,	68	10	—	
V-Bor (refined pentahydrate)	paper	,,	56	0	—	
	hessian	,,	57	0	—	
Commercial granular	paper	,,	45	10	76	0
	hessian	,,	46	10	77	0
,, crystal	hessian	,,	49	0	85	0
,, powder	paper	,,	49	0	81	10
	hessian	,,	50	0	82	10
,, powder extra fine	paper	,,	50	0	83	10
	hessian	,,	51	0	84	10
BP grade granular	paper	,,	—		89	0
	hessian	,,	—		90	0
,, crystal	hessian	,,	58	0	97	0
,, powder	paper	,,	58	0	93	10
	hessian	,,	59	0	94	10
,, powder extra fine	paper	,,	59	0	95	10
	hessian	,,	60	0	96	10

Prices are per ton, net weight, delivered free to customers' works in the UK.

Reductions of £5 a ton in the prices of Bisol dibutyl phthalate and di-isobutyl-phthalate, and of £2 10s a ton in the prices of Bisoflex phthalate plasticisers have been announced by British Industrial Solvents, Devonshire House, Piccadilly, London W1.

New prices for 10 ton spot lots, delivered UK in 40/45 gallon drums returnable at seller's expense, are as follows:

	£	s
Dibutyl phthalate ...	222	0
Di-isobutyl phthalate	204	0
Bisoflex 81	296	10
Bisoflex 88	246	10
Bisoflex 91	235	10
Bisoflex 791	246	10

Contract and bulk delivery allowances remain unchanged.

Market Reports

INDUSTRIAL CHEMICALS MORE ACTIVE

LONDON The industrial chemicals market has been more active than during the previous week, and a steady call for supplies has been reported for the general run of soda and potash products. A steady enquiry has also been reported for textile chemicals and for the materials used in the plastics and paint industries, and a moderate buying interest has been shown in hydrogen peroxide and arsenic.

Industrial chemical prices generally are firm and unchanged at recent levels. More buying interest is expected to develop during the next month for fertiliser materials. In the meantime, the volume of business is steady for the period. There is not much of fresh interest to report on the coal-tar products, Pitch continues in active request as also the cresylic acids and creosote oil.

MANCHESTER A generally firm price position has been maintained on the Manchester market for heavy chemical products during the past week and, apart from prevailing uncertainty regarding the trend in the non-ferrous metal compounds, the undertone is strong. Bleaching, dyeing and finishing chemicals are being taken up by the textile trades in fair quantities against contracts, and most other industrial outlets are absorbing reasonably good supplies, while a fair enquiry is reported on both home and shipping accounts. Some sections of the fertiliser trade are fairly active, while the light and heavy tar products are going into consumption reasonably well.

GLASGOW Although business has been steady in some sections of industry, conditions generally have been fairly quiet during the past week in the Scottish market. In regard to export, however, the position is much more favourable and being maintained at a good level. Prices on the whole have remained steady, although some variations have taken place.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s. 3d. including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period

ACCEPTANCES

Polycondensation of the ethylene glycol diester of terephthalic acid in the molten state. Vereinigte Glanzstoff-Fabriken AG. [Addition to 755 166.] **790 456**

Surface coatings for polymer dryers. Esso Research & Engineering Co. **790 593**

Hydrolysis of aliphatic dinitriles. Inventa AG für Forschung und Patentverwertung. **790 594**

Dealkylation of aromatic hydrocarbons. Esso Research & Engineering Co. **790 595**

Herbicide composition. Dow Chemical Co. **790 599**

Vinylidene chloride polymer compositions. Dow Chemical Co. **790 601**

Process for the production of acrylonitrile. Farbenfabriken Bayer AG. **790 462**

Separation of *L*-glutamic acid from a solution which has been obtained by alkaline hydrolysis of pyrrolidone carboxylic acid. Naamlooze Vennootschap Centrale Suiker Maatschappij. **790 602**

Polyamides as fuel oil additives. Esso Research & Engineering Co. [Addition to 723 639.] **790 604**

Nitro diarylamine methine dyes. General Aniline & Film Corp. **790,745**

Process and apparatus for the manufacture of solutions of bactericidal gas in water or aqueous liquid. Chlorator Ges. **790 746**

Manufacture of a cyclic ketone and the conversion thereof into its monoketals and into a keto alcohol and esters of same. Hoffmann-la Roche & Co., AG. **790 607**

Bis(1-nitrocycloalkylmethylamines). Du Pont de Nemours & Co., E. I. **790 608**

Nitric acid esters of cellulose and process of preparing same. Hercules Powder Co. [Addition to 781 534.] **790 470**

Carotenoid compounds and the manufacture of same. Hoffmann-la Roche & Co., AG. [Divided out of 790 614.] **790 615 790 616**

Open to public inspection on 19 February

Uranium-niobium alloys. UK Atomic Energy Authority. **790 991**

Hydrate of lignocaine hydrochloride and process for making it. Poole, A., and Brown, C. L. M. **790 762**

Pyridine bases. Distillers Co., Ltd. **790 994**

Treatment of fibrous materials with resinous condensation products. British Paints, Ltd. [Cognate application 3 304.] **790 837**

Separating sulphonates from solutions containing them. Esso Research & Engineering Co., formerly Standard Oil Development Co. **790 995**

Bonding natural or synthetic rubber. Phoenix Gummiwerke AG. **790 839**

Hard refractory metal boride compositions and their production. American Electro Metal Corp. **790 917**

Ester of chrysanthemum monocarboxylic acid and insecticidal compositions thereof. Union Carbide Corp. **790 841**

Manufacture of 1- and/or d-amino-methyl (3 : 4-dihydroxyphenyl)-carbinol. Farbwerke Hoechst AG. **790 920**

Processes for the production of selenium rectifiers. Siemens-Schuckertwerke AG. **791 053**

Nitro-dyestuffs and process for making them. Ciba Ltd. **790 921**

Polyisocyanate compositions. Imperial Chemical Industries, Ltd. **790 856**

Hydrocatalytic desulphurisation of petroleum hydrocarbons. British Petroleum Co., Ltd., Lester, R., and Porter, H. T. **790 857**

Cyclic process for utilisation of waste pickle liquor. Collin AG., F. J. **791 057**

Metallisable monoazo dyestuffs, complex heavy metal compounds thereof, and their use. Geigy AG., J. R. **790 904**

Manufacture of granulated mixed fertilisers. Risk, R. B. **791 004**

Removal of nitric acid from aqueous solutions. UK Atomic Energy Authority. **791 059**

Glycol complex esters. Geigy Co., Ltd. **790 923**

Mercurated alkyl biuret derivatives and process for their manufacture. Ciba Ltd. **790 906**

Apparatus for the separation of dissimilar liquids. Purolator Products, Inc. **790 789**

Refining of impure iron. British Oxygen Co., Ltd. **790 790**

Pharmaceutical preparation and process for making same. Glenwood Labs., Inc. **790 791**

Trimethylolethane. Celanese Corp. of America. **790 759**

Preparation of diaryl ketone polycarboxylic acids. Olin Mathieson Chemical Corp. **790 908**

Manufacture of acrylic acid and functional derivatives of acrylic acid. Badische Anilin- & Soda-Fabrik AG. **790 930**

Polymerisable organic nitrogenous compounds. Imperial Chemical Industries, Ltd. [Cognate application 18 555.] **790 796**

Producing 4-substituted 1, 2-diaryl-3, 5-dioxo pyrazolidines. Synfarma, Narodni Podnik. **790 931**

Fat-soluble azo-dyestuffs and process for their manufacture. Ciba Ltd. **790 797**

Propane treatment of petroleum wax. Esso Research & Engineering Co. **791 013**

Tanning, retanning and filling processes. Boehme Fettchemie Ges. **790 933**

Steroid compounds. Merck & Co., Inc. **791 065**

Method and apparatus for the production of titanium or like metal sponge. Montecatini Soc. Generale per l'Industria Mineraria e Chimica. **790 868**

Preparation of piperazine derivatives. Monsanto Chemicals, Ltd. **790 936**

Recovery of cyanopyridines. Distillers Co., Ltd. **790 937**

Method of producing metal borides. Kohlswa Jernverks Aktiebolag. **790 938**

Electrolytic deposition of refractory metals. Horizons Titanium Corp. **790 870**

Piperazine quaternary salts. Wellcome Foundation, Ltd. **790 800**

Process for the production of unsaturated polyester resins. Beck, Koller & Co. (England), Ltd. **790 940**

Thermoplastic compositions. Imperial Chemical Industries, Ltd. **790 942**

Zinc ferrite pigment. Columbian Carbon Co. **790 949**

Purification of aliphatic acids. Distillers Co., Ltd. **791 044**

Cross-linkable and cross-linked copolymers. Canadian Industries, Ltd. **790 808**

Electroluminescent phosphor. General Electric Co. **790 951**

Production of compounds of the anthraquinone series. Sandoz, Ltd. **790 952**

Production of tetracycline by fermentation. Lepetit Soc. per Azioni. **790 953**

Producing tachysterols and derivatives thereof. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **790 956**

Ships for transporting fluids under pressure. Leroux, R. **790 877**

Fuel oil compositions. Armour & Co. **790 957**

Method for agglomerating vulcanisation accelerators. Goodyear Tire & Rubber Co. **790 882**

Accelerators of vulcanisation of rubber. Goodyear Tire & Rubber Co. **791 068**

Production of alkali metal ferro-cyanides and ammonium sulphate. Imperial Paper & Colour Corp. **790 885**

Enzymes. Armour & Co. **790 966**

Rotary apparatus for conveying gases and liquids. Schaurte, P. [Addition to 782 105.] **790 968**

Glyceryl Ethers as Anti-TB Agents

TWELVE ounces of an oil believed to contain one of the world's most powerful anti-tuberculosis drugs was sent on 10 January from Britain to the Dutch Government Nutrition Research Centre at Utrecht. The twelve ounces of this oil, known as 'unsaponifiable material,' have been isolated from about 50 lb. of cod liver oil by a series of complicated chemical processes specially worked out in the Hull laboratories of British Cod Liver Oils Ltd.

In Holland the oil will be broken down still further until only a thimbleful is left, said Mr. G. E. Tunnicliffe, general manager of British Cod Liver Oils. Dr. C. Engel of the DGNRC believes that the substance which has proved so potent against the tubercle bacillus is contained in only one 'fraction' of the oil—the glyceryl ethers — representing about 1/2,500th part of pure cod liver oil.

The fraction isolated is stated by Dr. Engel to be as potent against tuberculosis germs as is penicillin against pus bacteria. He is now extending his tests to discover how effective the substance is in treating humans. In the US Dr. Horace R. Getz, medical director of the Hastings Foundation in California, discovered that cod liver oil concentrate cured tuberculosis in human patients, and investigations have continued to discover the active substance in the oil responsible for the cure. Both Dr. Getz and Dr. Engel, working completely independently, have tested a large number of other oils, fats and vitamins in attempts to find a similar substance. But cod liver oil alone has proved to contain the fraction active against tuberculosis.

CJB Open Research and Development Stations

A RESEARCH and development station has been established at Leatherhead, Surrey, by Constructors John Brown Ltd.

Its primary object will be to undertake sponsored development work on behalf of Government departments and industrial organisations, and also for the engineering and construction divisions of CJB. It will cover the following fields: (i) Process development and investigation of chemical engineering problems. (ii) Development of automatic control systems and their application. (iii) Special problems of nuclear engineering.

The new station has a site of four acres and is equipped with laboratories and pilot-plant buildings. Special attention has been given to facilities for development work requiring large-scale pilot plants. It started with a staff of 30 consisting of chemical engineers with experience in process development work, of automatic control engineers, and of supporting staff for chemical, physical, mathematical and design work.

British Firm Gets Bangkok Contract

WHAT is claimed to be the largest mechanised composting plant ever is to be built in Bangkok, capital of Thailand, by John Thompson Industrial Constructions Ltd. in conjunction with Compost Engineers Ltd. It is scheduled to come into operation in 1959.

The plant is designed to receive 1,100 cubic metres of refuse daily. Materials unsuitable for composting will be removed by manual and magnetic sorting. The compostable material will be shredded mechanically and refined in ballistic separators which remove fragments of non-ferrous metals, ceramic, etc. The refined material is then fed into special chambers in which the correct conditions for the development of aerobic fermentation will be provided in such a manner that temperature-duration conditions lethal to harmful organisms are created.

The composting process can be operated with or without sewage sludge, the rubbish being mixed with water if sewage is not added. Present plans at Bangkok are that certain quantities of dried sludge will be brought to the site as required.

After leaving the composting house the compost is taken to maturing areas where it is formed into stockpiles for final maturing. After six to eight weeks the matured compost will have a balanced nitrogen/carbon ratio. Most of the compost will be sold in bulk but some will be finely shredded for package sale.